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THE CANADIAN ENTOMOLOGIST.

VOLUME XXII.

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BALANINUS—ITS FOOD HABITS.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

All the described species of *Balaninus* inhabiting America north of Mexico when larvæ live in the fruit (nuts and acorns) of the various species of *Quercus*, *Castanea*, *Corylus* and perhaps *Fagus* of the order *Cupuliferæ*, and *Carya* of the *Juglandaceæ*. Acorns, somewhat largely used in this country in the arts and in the manufacture of certain dietetics, are mostly imported, the native production being rendered almost worthless by these larvæ; and our chestnuts as soon as collected must be kiln-dried or otherwise treated, which renders them greatly inferior to those of foreign countries. *Balaninus* has not yet received any attention from an economic standpoint, but from the above would seem deserving of some consideration in that direction. The systematic separation of the species has only been effected recently and definite characters furnished for their recognition. Say probably had all the now described species before him, and excluding *proboscoideus*, included them in his *rectus* and *nasicus*. The failure of Say, one of the clearest of describers, to make his species recognizable by description, is suggestive of the absence of points of saliency, and has been the source of much confusion in our literature, some of which is evidenced in the earlier volumes of the CANADIAN ENTOMOLOGIST.

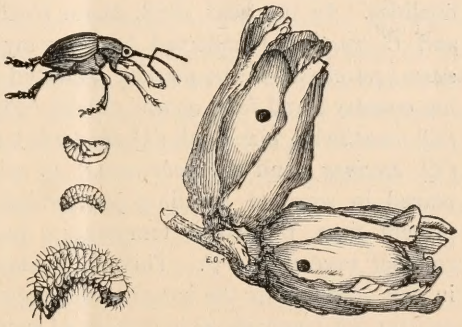

FIG. 1.

NOTE.—Figure 1, drawn by Miss Ormerod, represents a European species, *Balaninus nucum* Linn., which feeds upon filberts. It conveys a good idea of the characteristic forms of the genus.

The separation of *Balaninus* into species with valid characters was effected by Dr. Geo. H. Horn in a monograph of the genus in 1873 (Proc. Am. Phil. Soc., Phil., xiii., 457, et. seq.). The species assigned to Say's names were determined by the descriptions of Gyllenhal from types sent him by Say, and the assignment has not been questioned —*Requiat.* To the old species, *caryatrypes*, *rectus*, *nasicus* and *uniformis* (Lec., 1857), were added *caryæ* and *quercus;* and in 1885, Mr. F. Blanchard (Bul. Brook. Ent. Soc., vii., 107,) described *obtusus*. The systematic part of the work has been well done, yet the accurate separation of a mixed collection requires much care and considerable practice, and cannot be effected by mere inspection. To determine whether each species has a preference for some particular species of acorn or nut, or whether there is an absence of choice, I instituted some experiments in rearing them, the results of which I propose to give, without, however, claiming them as finalities. In the year 1888, larvæ from hazelnuts *(Corylus Americana* and *C. rostrata)* collected here by myself; from chestnuts *(Castanea vesca)* purchased in the market, collected in many places in the surrounding country ; and from acorns of white oak *(Quercus alba)*, chestnut oak *(Q. monticola)*, black oak *(Q. tinctoria)*, red oak *(Q. rubra)*, scarlet oak *(Q. coccinea)* and *Q. imbricaria*, all collected in the same woods, were placed in separate breeding jars, which were kept in my office till the present time, the winter temperature not falling below 40°, nor that of summer exceeding 65°. This was evidently an unnatural condition, and in part accounts for the irregular developement of the most of the species, and the not inconsiderable number of larvæ that go over till the next year.

B. proboscoideus Fab. *(caryatrypes* Bohm.).—This species was bred only from chestnuts. The first example appeared June 25 and the last July 12—a period corresponding with the blooming of the chestnut here. At the time of blossoming the chestnuts are fully formed, and larger than might be supposed. The envelope or burr is over three-fourths of an inch in height, soft, and covered with distant tubercles from which the prickles afterwards develope. The ♀ *proboscoideus* at this time deposits her eggs and dies, her life being limited to a week or two at the most—none being found after the bloom has fallen. About eighty examples were reared, the sexes being numerically equal. They were uniform in size and color, and beautifully variegated with fuscous lines and spots interspersed among the dense clothing of ochreous scales on the thorax and elytra. I have, how-

ever, seen in collections examples entirely ochreous. The ♀ beak varies in length from one and one-quarter to about twice that of the body. The character distinguishing it from all the other species is that the first joint of the funicle of the antenna is shorter than the second.

B. rectus Say.—This, like the preceding, was bred from chestnuts only. The first example appeared June 28, and others followed very sparingly, and till date (Oct. 1st) ninety-five examples have been taken. Pupæ in various stages and many larvæ are yet in the earth, and will no doubt go over till next year. The conditions in breeding are evidently unnatural, but why *proboscoideus* was not influenced equally (being in the same vessel) seems strange. In nature the beetles would certainly have been on hand for the chestnuts when in bloom, at which time they are taken by beating the blossoms. Though only raised by me from chestnuts, this species may breed here in acorns, as I took a ♀ May 15th with *nasicus* by beating. Dr. Levette, of Indiana, once sent me a set raised by him from Arizona acorns, the beetles appearing in December of the year in which the acorns grew, which in no way differ from those bred from chestnuts. The individuals vary greatly in size (4 to 7 mm.) and in colour. The general colour of the scales and hair is light brown above, paler below; the thorax has a dark brown discal stripe, limited at the sides and divided longitudinally by a pale yellow line, the elytra being interspersed in various ways with markings of the same colour. I have never seen one entirely unicolorous. The beak of the ♀ is very long and slender, equalling or even exceeding that of the preceding species in proportion to the size; this and the form of the thorax, which is long and conical, will distinguish the ♀ from all others. The ♂ has a shorter thorax, but it is still narrowed anteriorly; this, with small femoral tooth, oval elytra rapidly narrowed from base, and a yellowish or brownish spot of condensed scales on each side of the central line of the metasternum (occasionally obsolete), will, with practice, distinguish it.

B. quercus Horn.—This species was bred from all the species of acorns mentioned except the annuals (white and chestnut oak). The first example appeared June 10th, and till August 1st about one hundred and sixty were observed; scattering ones have since occurred from time to time, and now the earth contains a few pupæ and larvæ, but not so many as in the case of *rectus*. This species seems to have no preference for any of the kinds of acorns mentioned, being reared from each in about

equal numbers. Whether development was retarded or deranged by indoor raising is uncertain, as I never took even a single specimen by beating, though evidently excessively abundant. The individuals vary from 5 to 9.5 mm. in length. The general color of all bred was ochreous brown, nearly uniform on the thorax and variously interspersed on the elytra with small yellowish spots. My specimens from New Jersey and Florida are entirely cinereous, mottled on the elytra with darker spots, and look as if belonging to a different species. The ♂ of this species is distinguished from that of all the others by a very unique and striking character, viz., the pygidium deeply concave, with the cavity smooth and surrounded by an acute rim, fimbriated with long silken hairs. The beak of the ♀ does not equal in length that of either of the two preceding species, but is, in most cases, as long at least as the body ; the posterior margin of the hind femoral tooth is oblique ; the pygidium is very pilose and fimbriate, and the scape of the antennæ is short—about equal to the first two joints of the funicle (sometimes shorter and sometimes longer, the relative length of these parts not being a constant). The careful observance of these characters will readily separate it from any of its allies.

B. nasicus Say.—This species was bred abundantly from the acorns of the white and chestnut oaks, and six examples from those of the scarlet. The first example appeared June 1st, and one or two daily till July 6th, between which and the 16th about one hundred and fifty were observed, and scattering ones till the present writing (Oct. 1st). Some larvæ and pupæ are still in the earth. In nature, this species is taken here by beating from about the 10th of May till the last week in July in great abundance, and individuals occur till near October. The prevailing colour of the vestiture above is ochreous, variegated on the thorax and elytra more or less with brownish markings, many examples, however, are nearly uniform in colour, varying from pale ochreous to dark brown, and I have a specimen from Florida that might be called cinereous. The beak of the ♀ is about the length of the body in the majority of individuals, and in the remainder either longer or shorter in about equal numbers. The species may be distinguished at a glance from all others except *caryæ* by the larger posterior femoral tooth, the hind border of which meets the femur at a right angle, with no tendency to become sinuate or obtuse.

B. caryæ Horn.—This species has not been taken here, and was not

bred, as I could not obtain last year any hickory nuts containing larvæ, but as more success was had this season I hope hereafter to make known whether *caryæ* will be developed. It is somewhat difficult to find infested hickory nuts, as comparatively few are attacked. The *Carya glabra* seems to be preferred, next the *C. alba* and *C. amara*, while *C. tomentosa* and *maxima* are nearly exempted. From one to eight larvæ will inhabit a single nut, their size not being affected by the number. Many of them never attempt to gnaw out of their bony habitation, but when full fed shrivel up and die. In size they equal the larvæ of *proboscoideus*. Some of the nuts are also depredated on by a lepidopterous larva, apparently the same as one of the four species I find in acorns. This is not an inquiline, but feeds on the kernel either with the *Balaninus*, or by itself, there being seemingly no place of entrance. Two other species inhabit the thick hulls of *tomentosa* and *alba* which I hope to rear. This species averages larger than *nasicus*, which it much resembles, but differs by the larger femoral teeth; the tibiæ more strongly mucronate at tip, and the narrow hair like (not oval) scales below. The ♀ beak is rather longer; the last ventral more deeply impressed, and the antennal scape about equals four joints of the funicle. My specimens were bred by Dr. Levette, of Indiana, from *C. olivæformis*, Pecans.

B. uniformis Lec.—This species was bred from the acorns of all the biennials in about equal numbers, and three examples from those of the chestnut oak; forty-two specimens were taken in all—not nearly so numerous as *quercus* with which it was reared. The first example was seen June 21st, and none after August 1st. The individuals were very uniform in size (5.5 to 6.5 mm. in length) and color, being all clothed with cinereous pubescence of a scaly nature, and the elytral intervals variegated with darker spots. My specimens from Texas and New York are exactly similar. This is not the typical color. The species was described from examples taken at Sacramento, California, and at Steilacoom, Washington, which were "concolorous" and "densely fulvo-pubescent," but colour is of no value in the species of this genus. The nostrum of all the females seen was shorter than the body; the antennal scape short, about as long as the first two joints of the funicle. The femoral tooth in both sexes is comparatively small, with the posterior edge deeply sinuous. This and the foregoing ♀ characters will help to distinguish this species, but in case of doubt, reference in this, as in all other

species, should be made to the two papers mentioned for more minute characters.

B. obtusus Blanch.—This species was bred from hazelnuts alone. The first example was seen June 25th, and the last July 20th. From about one-third pint of nuts 24 specimens were obtained, the size and colour of which were nearly uniform. Compared with *uniformis*, this species is of a more robust facies; the claw appendices are broader; the beak of both ♂ and ♀ is much thicker and black altogether, or at least to the insertion of the antennæ, the base being in both sexes punctured, and in the ♂ more or less striated. The scape of the antenna of the ♀ is equal in length to that of three of the succeeding joints of the funicle combined; the femoral tooth is stronger than in *uniformis*, with the posterior edge oblique and less sinuate; the last ventral of the ♀ is rounded at tip and strongly pubescent; not at all impressed as in the preceding. The differences are somewhat comparative, but in the absence of more salient points, this is about all that can be done by description. This species in nature seems to be short lived, as I have never obtained it by beating previous to June 20th, nor after July 15th; till about this time the shell of the nut is soft and easily pierced; the puncture for the egg is made directly through the involucre and shell into the kernel near its base.

There is a nondescript form of *Balaninus* which I did not raise, of which about thirty examples were taken in June with *nasicus* in beating oak by Mr. Klages in Westmoreland County, and about a dozen others were received from Mr. S. Auxer, of Lancaster, Pa. It seems to be allied to *obtusus*, *uniformis* and *nasicus*, but cannot well be assigned to either. The form, density of vestiture, shape of the elytra and colour are the same as in *nasicus*, but the femoral tooth is much smaller and oblique, and the beak of the ♀ does not often exceed two-thirds the length of the body; this last character groups it with *uniformis* and *obtusus*, with the former of which it agrees in having the claw appendices acute, but differs by having the beak thickened and punctured at base in both sexes like in *obtusus*, by the longer antennal scape of the ♀, which is equal to at least the three first joints of the funicle (in *uniformis* to joints one and two), and by the denser covering of hair-like scales and less robust form of body; the femoral tooth is a little larger, oblique and less sinuate posteriorly. From *obtusus* it differs by the claw appendages being acute

(not obtuse), its much less robust and posteriorly attenuated form, and by the more or less impressed last ventral segment of the ♀; *obtusus* is much more sparsely clothed. There are other minor differences, but the above suffice to show that it is not in harmony with any of the species mentioned. From a mixed lot of *nasicus* its separation requires an examination of the femoral tooth in every individual, but mixed with the other two, simple inspection will suffice in the most of cases.

It is quite probable other species of *Balaninus* remain to be discovered, only one species of which is known from the Pacific Coast. A very pleasant and certain way to determine this would be for collectors everywhere to rear them from nuts and acorns and publish the results. Other modes of collecting are not to be relied on, as for example, in twenty years collecting here I only took *nasicus* and *obtusus*, and in chestnut time *rectus*, but all this time all the other species (*caryæ* probably included) were sufficiently abundant.

DISTRIBUTION.

B. proboscoideus.—Middle States westward, Horn; Massachusetts, Blanchard; Tennessee, Illinois, District of Columbia, Ulke; Ohio, West Virginia, Pennsylvania.

B. rectus.—Middle and Southern States, Horn; Arizona, Smith; District of Columbia, Virginia, Ulke; Canada, New York, Massachusetts, Pennsylvania, Ohio, West Virginia.

B. quercus.—Illinois, District of Columbia, Ulke; New York, New Jersey, Pennsylvania, West Virginia, Ohio.

B. nasicus.—Canada to Georgia, and westward to Colorado and New Mexico.

B. caryæ.—Illinois, Ulke; Indiana, Levette; Kansas (Douglas Co.), Snow; Pennsylvania, Klages.

B. uniformis.—Canada to Florida, from the Atlantic to the Pacific.

B. obtusus.—Massachusetts, New Hampshire, Blanchard; Texas, Nebraska, Horn; Ohio, Pennsylvania, West Virginia.

Undescribed form.—Massachusetts, North Carolina, Blanchard; Pennsylvania (Lancaster Co., Auxer; Westmoreland Co., Klages).

Balaninus has a single parasite common to all the species, except that it was not reared from *obtusus;* the larva was not observed while living in that of *Balaninus*, but it forms a tough papery cocoon so thin

and transparent that the enclosed larva and pupa can be observed. These cocoons occupy the cell formed by the *Balaninus*, and are shaped much like those of the large ants, but much larger. The imago is quite graceful, the ♀ ovipositor being proportionately as long as in *Rhyssa*. Mr. Cresson would have described this species under the specific name *balanini*, but was anticipated by Mr. W. H. Ashmead, who probably describes the same thing under the name *Urosigalphus armatus* (Proc. U. S. Nat. Museum, 1888, p. 637, but only issued Oct. 1st, 1889). Besides the larvæ of *Balaninus*, those of at least four lepidopters infest acorns, two of which seem to enter by the holes made by the *Balaninus* in leaving, and live on the debris within. The other two are found with the *Balaninus* larvæ, one of them feeding on the refuse made by them, but the other depredates on the substance of the acorn, and is sometimes found in acorns by itself; it pupates in the earth without forming a cocoon. The others formed thin papery cocoons against the sides of the jars in which they were confined. I failed to obtain their names, the gentlemen of whom inquiries were made being seemingly unacquainted with these forms.

SUMMARY.

B. proboscoideus is so far only known to depredate on chestnuts.

B. rectus has been reared here from chestnuts only, but elsewhere from Arizona acorns.

B. quercus was reared in about equal numbers from the acorns of all the biennial fruiting oaks mentioned.

B. nasicus prefers the acorns of the annual fruiting oaks (white and chestnut), but depredates sparingly on those of biennials.

B. caryæ has been reared from pecan hickory nuts elsewhere, and many larvæ from nuts grown here are now in rearing and will almost certainly develope this species.

B. uniformis prefers the acorns of biennials, but will depredate occasionally on those of annuals (chestnut oak).

B. obtusus is only known to depredate on hazel nuts.

The indescript form probably lives in acorns in the larva state, but has not been reared.

Obs.—The acorns of all species were collected from oaks growing in the same place promiscuously, so that the parent beetles evidently discriminated in their choice.

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 219, Volume xxi.)

Genus ARCTIA Schrank.

1802—Schrank, Fauna Boica II., 2, 152.

The typical genus of the family—a general favorite with collectors and the source of a good deal of worry and uncertainty to describers. I have seen very large series of specimens of many species, and have seen nearly all the species. From a rather careful study of the species I can see no reason why they should not be as easily recognizable or limited as those of any other Lepidopterous genus—indeed, the problem strikes me as a remarkably easy one, the key to which lies in the fact that no amount of obsolescence of maculation authorizes a species, while change of *pattern* can be easily detected even in specimens with the markings much broken. Reference for general papers, lists, &c., relating to American species, are :—

1816—Hübner, Verzeichniss, 183.
1856—Walker, C. B. Mus. Lep. Het., III., 594, syn. sp.
1860—Clem , Proc. Ac. N. Sc. Phil., XII,, 526.
1873—Stretch, Zyg. and Bomb., 73, fig. and syn. sp.
1876—Moeschl., Stett. Ent. Zeit., 37, 296.
1883—Neumoegen Papilio, III., 150, list sp.
1887—Smith, Ent. Amer., III., 117.

In the paper last cited I give at some length the features to be relied upon for specific separation in this genus.

The head is retracted, tongue weak and short, palpi almost rudimentary, antennæ moderate in length ; bipectinated in the ♂, simple in the ♀. The legs are moderate in length, the posterior longer ; spurs short and weak, but normal as to number ; the tarsi are finely spinulose, the claws simple.

Moeschler, in the Stett. Ent. Zeit., 1876, v. 37, p. 296, says :—*A. nais, phyllira* and *virgo* have a distinct claw on the fore tibia, but I utterly failed to find any trace of it on any specimens examined by me.

The venation of *virgo* and *argc*, compared, showed no differences; ten out of the subcostal in each, neither with an accessory cell. In other respects it agrees with the venation typical of the family.

The recent suggestions as to synonomy have been so conflicting, and none being based on a monographic study, they are simply indicated under the proper head, but not adopted.

A. achaia Grt. & Rob.

1867—Grt. & Rob., Trans. Am. Ent. Soc., I., 334, pl. 6, ff. 44, 45, *Arctia.*
1868—Bd., Lep. Cal. (Am. Soc. Ent. Belg., XII.) 76, *Chelonia.*
1873—Stretch,* Zyg. and Bomb., 74, *Arctia.*
1873— " " " 124, pl. 5, ff. 17–21, *Arctia.*
1875—Hy. Edw., Proc. Cal. Ac. Sci., V., 187, *Arctia.*
1881—Butl., Papilio, I., 131, *Arctia.*
1882—Stretch, Papilio, II., 91, varieties of.
1887—Smith, Ent. Amer., III., 111, *Arctia.*
var. *barda* Edw.
1881—Edw., Papilio, I., 39, *Arctia.*
var. *ochracea* Stretch.
1873—Stretch, Zyg. and Bomb., 124, pl. 5, ff. 18 and 21.
1881—Butl., Papilio, I., 131, an sp. dist. *Achaia.*
Habitat—No. Calif., Oregon.

A. anna Grt.

1863—Grt., Proc. Ent. Soc. Phil., II., 335, pl. 8, f. 1, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, 220, pl. 9, f. 6, ♀, *Arctia.*
1875—Streck., Lep. Rhop. et. Het., I., 106; =*persephone.*
1875—Grt., Can. Ent., VII., 196, an sp. dist.
1878—Streck., Proc. Dav. Ac. Sci., II., 273, =*persephone.*
1879—Græf, Bull. Bkln. Ent. Soc., I., 4, =var. *persephone.*
1883—Hulst, Bull. Bkln. Ent. Soc., VI., 70, =*parthenice* var.
1883—Neum., Papilio, III., 149, =*persephone.*
var. *persephone* Grt.
1863—Grt., Proc. Ent. Soc. Phil., II., 433, *Arctia.*
1864—Grt., Proc. Ent. Soc. Phil., III., 77, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
1886—Grt., Can. Ent., XVIII., 110, =*anna* var.
1887—Smith, Ent. Amer., III., 110, *Arctia.*
virguncula ‡ Wlk.

1856—Wlk., C. B. Mus. Lep. Het., III., 609, *Arctia.*
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, pr. syn.
Habitat—Penna., N. Y.

The form *anna* is much the least common, being in fact but a suffused form of *persephone.* By the operation of the law of priority this suffused and aberrant form must remain the species, while the normal form remains the variety. It is much more widely distributed than above indicated.

A. approximata Stretch.
1885—Stretch, Ent. Amer., I., 104, *Arctia.*
Habitat—Canada.

A. arge Dru.
1770—Drury, Illustr., I., 35, pl. 18, f. 3, *Noctua.*
1791—Oliv., Enc., Meth., V., 92, *(Phalaena).*
1816—Hübner, Verz., 183, *Arctia.*
1837—Westw., ed. Drury, I., 33, *Spilosoma.*
1841—Harris, Rept. Ins. Mass., 244, *Arctia.*
1856—Wlk., C. B. Mus. Lep. Het., III., 609, =*dione.*
1858—Duncan in Jard. Nat. Lib., XXXII., 174, pl. 19, f. 2, *Spilosoma.*
1860—Clem., Proc. Ac. N. Sci. Phil., XII., 528, *Arctia.*
1862—Harris,* Ins. Inj. to Veg. ed. Flint, 346 *(life hist.)*
1873—Stretch,* Zyg. and Bomb., 74, 225, pl. 9, ff. 10 and 11, *Arctia.*
1874—Lintner,* Ent. Contr., III., 143, *Arctia.*
1875—Grt., Can. Ent., VII., 196, *Arctia.*
Andrews,* Psyche, II., 79, *Arctia.*
1882—Gilbert,* Papilio, II., 50, *Arctia.*
1887—Smith, Ent. Amer., III., 111, *Arctia.*
dione Fabr.
1775—Fabr., Syst. Ent., 572, *Bombyx.*
1781—Fabr , Spec. Ins , II., 186, *Bombyx.*
1787—Fabr., Mant. Ins., II., 116, *Bombyx.*
1793—Fabr., Ent. Syst., III., 1, 442, *Bombyx.*
1797—Sm. Abb.,* Ins. Ga., I., 125, pl. 63.
1816—Hübner, Verzeichniss, 180, *Euplagia.*

1837—Westw., ed. Drury Illustr., I., 32, pr. syn.
1856—Wlk., C. B. Mus. Lep. Het., III., 609, *Arctia.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 528, *Arctia.*
1862—Clem.,* App. to Morris, Syn., 340, pr. syn.
1863—Saund., Synopsis Can. Arct., p. 7, *Arctia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 118, pr. syn,
1868—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 78, *Chelonia.*
1883—Neum., Papilio, III., 150, an sp. dist.
1886—Grt., Can. Ent., XVIII., 108, *Arctia.*
1887—Smith, Ent. Amer., III., 111, pr. syn.
Habitat—Canada to Georgia, Texas, west to California, Vancouver; abundant.

Recorded food plants are *Plantago* and *Polygonum*, but the list is much larger.

A. blakei Grt.

1864—Grt., Proc. Ent. Soc., Phil., III., 523, pl. 5, f. 2, ♀, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, 224, pl. 9, f. 9, ♂, *Arctia.*
Habitat—Colorado.

A. bolanderi Stretch,

1873—Stretch, Zyg. and Bomb., 74, 76, pl. 3, f. 13, *Arctia.*
1887—Smith, Ent. Amer., III., 111, *Arctia.*
Habitat—California.

A. brucei Edw.

1888—Edw., Ent. Amer., III., 183, *Arctia.*
1888—Bruce,* Ent. Amer., III., 219, *Arctia.*
Habitat—Colorado.

Food plants are *Plantago* and *Polygonum.*

A. celia Saund.

1863—Saund., Proc. Ent. Soc., Phil., II., 59, *Arctia.*
1863—Saund., Syn. Can. Arct., p. 13, *Arctia.*
1865—G. & R., Ann. Lyc. Nat. Hist., N. Y., VIII., 368, =*figurata.*
1869—Saund.,* Can. Ent., II., 74, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, var. *figurata.*
1883—Hulst, Bull. Bkln. Ent. Soc., VI, 70, =*nais.*
1887—Smith, Ent. Amer., III., 111, *Arctia.*
Habitat—Canada.

A. cervinoides Strk.

1876—Strk., Proc. Ac. N. Sci., Phil., XXVIII., 151, *Arctia.*

1879—Strk., Rept. Chief., Eng., 1878-79, V., 1860, pl. II., f. 4, *Arctia.*

1887—Smith, Ent. Amer., III., 112, *Arctia.*

Habitat—Colo., July 15.

This will prove an undersized *phyllira*, with black secondaries.

A. complicata Wlk.

1864—Wlk., C. B. Mus. Lep. Het. Supp., XXXI., 279, *Arctia.*

1868—Grt., Tr. Am. Ent. Soc., II., 117, *Arctia.*

1873—Stretch, Zyg. and Bomb., 74, 79, =*dahurica.*

1883—Neum. Papilio, III., 149, =*achaia* var.

A. dahurica Bdv.

1843—Bdv., Icon., Hist. Lep., 126, pl. II., f. 1, *Chelonia.*

1845—H. Sch., Schmett Eur., II., 145, *Chelonia.*

1852—Bdv., Lep. Cal. (Ann. Soc. Ent. Fr.), 49, *Chelonia.*

1856—Wlk., C. B. Mus. Lep. Het., III., 597, *Arctia.*

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 527, *Arctia.*

1862—Clem., App. to Morris Syn., 341, *Arctia.*

1867—G. & R., Tr. Am. Ent. Soc., I., 336, pl. 6, f. 41, ♂, *Arctia.*

1873—Stretch, Zyg. and Bomb., 78, pl. 3, f. 10, ♀, *Arctia.*

1883—Neum., Papilio, III., 150, var. *complicata.*

Habitat—California.

A. decorata Saund.

1863—Saund., Syn. Can. Arct., p. 12, *Arctia.*

1863—Saund., Proc. Ent. Soc., Phil., II., 60, *Arctia.*

1864—Grt., Proc Ent. Soc., Phil., II., 77, pl. I., f. 4, ♀, *Arctia.*

1865—Grt., Ann. Lyc. N. Hist., N. Y., VIII, 369, =*nais.*

1873—Stretch, Zyg. and Bomb., 74, =var. *nais.*

1878—French,* 7th Rept. Ins. Ills., 182, *Arctia.*

1881—French,* Papilio, I., 8, *Arctia.*

1882—French,* Papilio, II., 179, *Arctia.*

1883—Hulst, Bull Bkln. Ent. Soc., VI., 70, =*nais.*

1883—Neum., Papilio, III., 149, an sp. dist. *nais.*

1887—Smith, Ent. Amer., III., 111, =*nais.*

colorata Wlk.

1864—Wlk., C. B. Mus. Lep. Het., XXXI, 302, *Aloa.*
1868—Grt., Tr. Am. Ent. Soc., II., 117, pr. syn.
Habitat—Can., N. Y., Penna.

The citation of *colorata* as a synonym of *decorata* was made by Mr. Grote before he concluded that *nais* and *decorata* referred to the same forms. I leave the reference as made, since the monographic study of the species may develope the above as the correct conclusion. See under *nais* for further references.

A. determinata Neum.
1881—Neum., Papilio, I., 28, *Arctia.*
Habitat—Colorado.

A. docta Wlk.
1856—Wlk., C. B. Mus. Lep. Het., III., 592, *Euprepia.*
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, =*mexicana.*
mexicana Grt. & Rob.
1865—G. & R., Ann. Lyc. N. Hist., N. Y., VIII., 367, pl. 13, f. 3.
1883—Neum., Papilio, III., 150, =*docta.*
autheola Bdv.
1868—Bdv., Lep. Cal. (Ann. Soc. Ent. Belg., X.), 76, *Chelonia.*
1876—Stretch, Zyg. and Bomb., 74, pl. 3, ff. 3, 4, *Arctia.*
1881—Butler, Ann. & Mag., N. H., Ser. 5, VIII., 310, =*docta.*
1883—Neum., Papilio, III., 150, =*docta.*
arizonensis Stretch.
1873—Stretch, Zyg. and Bomb., 217, pl. 9, f. 4, *Arctia.*
1876—Stretch, Rept. Surv. West. 100 Mer., V., 799, pl. 46, ff. 2 and 3, = var *docta.*
1883—Neum., Papilio III., 150, =*docta.*
Habitat—Ariz., Calif., Mexicana.

A. dodgei Butler.
1881—Butl., Ent. Mo. Mag. XVIII., 136, *Arctia.*
Habitat—Unknown.

According to Mr. Butler this may be a Mexican representative of Drury's species *phyllira*, but the single specimen bears no locality label.

(To be continued.)

NOTE ON THE LARVAL ORNAMENTATION OF THE N. AM. SPHINGIDÆ.

BY A. R. GROTE.

In my "Hawk Moths of North America," I have assumed that the caudal horn is a prolongation of the skin itself, stiffened by chitine (p. 41). It supports a bristle, or pair of bristles, and Dr. W. Müller, whose valuable work on the *Nymphalidæ* of South America in their larval stages (Zoologischen jahrbuchern, 1886.) I have noticed in these pages, figures the horn of *Dilophonota*, p. 249, and regards it as a prolongation of the base supporting the two normal bristles of the eleventh segment. We may assume that the caudal horn is a later development, and that the surmounting bristles were originally sessile as in the *Attacinæ*. The bristles themselves may have disappeared, and the horn itself, the prolongation of the base, remain. I would draw attention to this character as supporting generally my arrangement of the family. The thoracic "horns" of *Ceratomia* are probably homologous with those of *Citheronia*. This character, together with the comparatively sunken head and soft brown colors of the moth allies *Ceratomia* with *Triptogon*, as I have pointed out. Dr. Wm. Müller concludes that the caudal horn of the Hawk Moths is the remains of what was once a system of bristles, and that there is a perfect homology with the *Saturnidæ*. This entirely agrees with my idea as to the derivation of the family, which may have thus been thrown off from the Spinners in a parallel direction with the *Ceratocampinæ*, The modern *Smerinthinæ* remain as the descendants of intermediate phases, the ocelloid spots and colors of the moth are retained. In this sense they are synthetic characters appearing in the other three or four groups which are to be referred to Smerinthoid affinities. The relatively small and sunken head, and the square prothoracic parts, the pectinate antennæ, are probably low characters in the Hawk Moths, recalling the Bombyces. In this view the shape of the body in *Hemaris* and allies is a point of widest departure, and warrants the position I assign to the *Macroglossinæ*. The method of pupation needs further elucidation. It must be studied in this group, with regard to the physical nature of the surface. Probably the cocoon is older than the absence of silk, the tendency to spin silk appearing by reversion in species to-day where it seems to have become gradually lost as a character. The change to pupation in the earth may have had some relation to changes in the surface conditions in past ages.

DESCRIPTIONS OF LEPIDOPTEROUS LARVÆ,

BY WM. BEUTENMÜLLER, NEW YORK.

MAMESTRA LOREA, Güen.

Head black, with dirty, whitish, irregular markings; antennæ pink. Body of a dirty, creamy, brown color, except the first three segments blackish. Along the dorsum is a series of lozenge shaped blackish patches, one on each segment; on the dorsum are also two rows of minute piliferous spots and two rows along each side, where there is also on each segment an ill-defined, oblique, blackish stripe. Underside semi-translucent whitish, with a number of minute piliferous spots which bear a short pale brown hair, as also do the spots above. Thoracic feet pale brown. Length 34 mm. Collected April 21st. Imago emerged May 18th. Food-plants, strawberry and wild geranium.

PHYCIS RUBIFASCIELLA, Pack. variety.

Head deep chestnut brown, rugose; mouth parts whitish, cervical shield chestnut brown. Body brown, with a pinkish hue; on each side of the body are scattered a few minute piliferous spots each, with a short pale brown hair; on each side of the first and second segment is a shiny black spot. Thoracic feet black; abdominal leg concolorous to the body, which is the same as above. Length, 13 mm. Collected May 30th. Imago emerged June 17th. Food plant, alder. Living in a horn-shaped case. Another form of this species was published by me in the Ent. Amer., V., p. 38.

SALEBRIA CONTATELLA, Grote.

Head jet black, shining, as is also the cervical shield. Body pale green, with a series of about four or five longitudinal stripes, almost of the same hue, along each side, where there are three rows of minute piliferous spots, each bearing a short, light brown hair. Underside of body same color as above, except the first segment, dull black. The segments slightly decrease in size toward the posterior portion of the body. Length, 15 mm. Food-plant, locust *(Robinia pseudacacia)*. Living singly between two leaves spun together flatly. June 5th. Imago emerged July 8th.

BOTYS FISSALIS, Grote.

Head small, pale brown, shiny; mouth parts pitchy. Body very shiny, yellowish white, semi-translucent, with a number of piliferous spots concolorous to the body, except those in the first, second and third seg-

ments, which are brown. Each spot with a light brown hair. The cervical shield same color as the body ; lateral edges brown ; underside same as above ; thoracic feet tipped with brown. Length, .24 mm. Food-plant, asters ; drawing together several leaves so as to form a bunch. May 31. Imago emerged June 18th.

SALEBRIA CELTELLA, Hulst (MS.)

Head pitchy black, with irregular, dirty, whitish markings, and an oblique stripe of the same color on each side. Body pale green, with a number of pea green, equidistant, longitudinal stripes, as broad as the intervening spaces. Cervical shield jet black, and on which the stripes of the body are sordid white. Along the subdorsum is a row of minute piliferous spots, and two rows along the sides. Body beneath green, and without marking, except the first segment is jet black, as are also the first pair of thoracic feet. A few hairs are also scattered over the body. Length, .22 mm. Food plant, *Celtis occidentalis*, folding together a few of the terminal leaves. Aug. Spins a rude cocoon between leaves.

NOTE ON THE GENUS CROCOTA AND PROF. J. B. SMITH.

BY A. R. GROTE.

Readers of Mr. Smith's papers will have noticed the frequent critical remarks at my expense, and it may have appeared to them that I have been often most culpable. But, in every case, although I have not the pleasure of knowing all of Mr. Smith's publications, these criticisms can be shown to be perversions of the case. So in the genus *Crocota*, in which determinations are difficult, Mr. Smith says (p. 193, vol. XXI.) :— "The matter has been further confused by Mr. Grote's persistent refusal to refer to Mr. Reakirt's species," and further that "he ignores them altogether." I ask anyone how I can "confuse" the "matter" by simply not referring to Mr. Reakirt's species by name, seeing that I do not know these species, have never seen the types, and am not disposed to believe in them? And, moreover, since Mr. Reakirt's descriptions refer to Eastern species, *postdating* my own, and those of other author's which I discuss, if they are not distinct species they are thus clearly synonyms, and Mr. Smith says the descriptions may be "poor," as indeed they seem to me to be. But the whole statement is inaccurate, for everywhere,

where I have referred collectively to the species of *Crocota*, I have also expressly referred to Mr. Reakirt's descriptions, giving my reasons for not particularly citing the species by name. Hence, my writings have had the exactly contrary effect, to that stated by Mr. Smith, "of causing others to lose track of" Mr. Reakirt's "descriptions." I always reminded students of the existence of Mr. Reakirt's descriptions, though I confessed I could not make them out. Nor is Mr. Smith apparently any wiser than I. I did, indeed, suppose that *nigricans* was a synonym of *opella*, or founded on the dark form of that species, but I kept this and all other surmises to myself, because I had no certain data to go upon, and a scientific writer must, in such cases, have a reasonable certainty. With regard to *læta*, I, in my first list, am the first to refer *treatii* here, to show that I had probably rediscovered a totally unknown species since Boisduval's figure. I first, in fact, direct attention to this unrecognized figure, which has been copied in Encyc. Brit. To me belongs the credit of directing Mr. Smith's attention to this figure of *læta* and its probable identity with *treatii* in my first Check List. This identification is not quite assured in the absence of any description ; hence, in my new Check List, I made a query. If Mr. Smith had written correctly and impartially on the genus *Crocota* he should have said : Mr. Grote first refers this genus to the *Arctiinæ* on account of the presence of ocelli, and removes it from the *Lithosiinæ* where he leaves *Ameria*. Further, Mr. Grote has figured the species he described in Proc. Ent. Soc., and no doubt exists, in a confusing genus, of the species he intended. Instead of this, with the evident intention of making an adverse criticism *coute qui coute*, we have the perversions above exposed. As was the case when Mr. Smith replied to my statement, that, in the *Deltoidinæ*, the eyes were always "naked," that in one genus the eyes were "lashed" (as if these characters were contradictory or exclusive), it must seem clear that the limit of proper criticism is exceeded by Mr. Smith. The errors of an author must be judged by the material at his command in specimens and literature. If under all the circumstances under which he laboured his work is of a character virtually to advance the study of his subject, and if a large proportion of his determinations are accurate and in the state of the science very opportune, no right-minded person should be able to bring himself to prevert such labours. I may remark, in conclusion, that I do not regard *Cydosia*, *Cerathosia* or *Gnophæla*, as *Arctiinæ*, and I believe

that they are thus incongruously placed and associated. Both *Cydosiæ* and *Gnophœla* appear to me to be *Zygœnidæ* with Bombycid analogies *in sensu* Packard. I hope Dr. Packard may be induced to study these forms. Neither do I believe our Texan species of *Cydosia* to be the *nobilitella* of Cramer. But all these questions, which ever way a full knowledge of these moths my determine us, must be entered into without temper and without unnecessary animadversions upon those whose experience has led them to opposite conclusions from those reached by the final verdict, a verdict which Mr. Smith's studies will, we may hope, be of a character to influence.

NOTES.

NOTES OF THE YEAR.

Dear Sir: With few exceptions insects were unusually scarce last season, probably on account of the continued cool weather and heavy rains. *Colias Philodice*, generally so abundant, was almost entirely absent, a few appeared in midsummer and the fall brood was more plentiful, but by no means abundant, and the latter might be said of most of our diurnals. The Noctuas were also conspicuous by their absence, at least at sugar, the baits failing to attract even the commonest species. *Eufitchia ribearea* was observed in numbers in a plot of black currant bushes, in an old orchard now included in Mount Royal Park, and *Orgyia leucostigma* was abundant on shade trees about the city. In the fall I found several species of *Eristalis* common on solidago blossoms, *E. Bastardi* and *E. Brousi* being especially abundant, while *E. transversus*, *E. Tenax* and *E. dimidiatus* were less common. The other orders were poorly represented, making it one of the worst collecting seasons in my experience.

F. B. Caulfield, Montreal.

ACKNOWLEDGMENT.

Dear Sir: The photograph from which the beautiful figure on p. 204, vol. xxi. of *Papilio Turnus* (aberrant form) was taken by Mr. H. N. Topley, of Ottawa, by the new Isochromatic process, and the engraving was made direct from the photograph. This acknowledgment should have appeared in the article, but was accidently omitted from the proof.

J. Fletcher.

A CORRECTION.

Dear Sir : In my note which appeared in your November number, I wrote, through inadvertence, *Phytolacca decandra.* The plant I referred to is *Veratrum viride*—not the "Garget," but the "Indian Poke" or "Poison Poke." I am ashamed at having to take up valuable space with a correction. THOMAS W. FYLES.

CORRESPONDENCE.

THE COTTON WORM.

Dear Sir : The cotton worm *(Aletia Xylina*, Say). This interesting moth has been tolerably abundant during the middle of September in this district, and is as much of an entomological conundrum as ever. I took several specimens round the electric lights. They seemed quite fresh and presented no appearance of being travel-worn by their supposed journey from the cotton fields of the "land of Dixie" I captured two specimens on September 19 and endeavoured to hibernate them but failed, one dying on October 12th and the other on October 15th. I hope to make another attempt at some future day. It does seem curious that we cannot solve the problem of the northern food-plant of this moth.

E. BAYNES REED, London, Ont.

CHRYSALIDS DEVOURED BY CATERPILLARS.

Dear Sir : A few days ago I found a number of *Pyrameis cardui* larvæ and also several (4) of the common reddish brown hairy caterpillars *(Spilosoma Isabella)*, so often seen about gardens in the fall feeding on plants of the common garden hollyhock *(Altheæ rosea)*. Not having extra boxes to spare I placed both species in a roomy pasteboard box with a plentiful supply of hollyhock leaves. In the course of a day or two several of the Cardui larvæ hung themselves to the corner of the box, and in a short time three more transformed to chrysalids. What was my surprise on looking into the box this morning to see if any more had hung or transformed to find the reddish brown caterpillars had devoured two of the Cardui chrysalids, and one of the caterpillars was actually engaged eating the third and had consumed fully one-half of it. This was not done from lack of food, as there was an *abundance* in the box. Here, then, is a new source of destruction to our butterflies—a sort of cannibalism among caterpillars.

SHELLEY W. DENTON, Wellesley, Mass.

Mailed January 9th.

The Canadian Entomologist.

VOL. XXII. LONDON, FEBRUARY, 1890. No. 2.

DESCRIPTION OF A NEW SPECIES OF MELITÆA FROM SOUTHERN CALIFORNIA.

BY W. H. EDWARDS, COALBURGH, W. VA.

MELITÆA AUGUSTA.

Male.—Expands from 1.6 to 1.75 inch; belongs to *Chalcedon* group, but is as conspicuously red as the species *Chalcedon* is black; upper side black, the surface nearly covered with light red and pale yellow spots, disposed as in the group; the basal areas dusted with yellow scales, which, on primaries, extend along both margins; costa of same wing edged red; both hind margins bordered by small red spots, varying in shape, sometimes narrow and as of a broken stripe, sometimes more or less rounded or ovate; the spots of second row are small, lunular, largest on secondaries, edged with red, the interior being yellow, or they are nearly all red with a small yellow patch in middle; sometimes this yellow is thinly washed red; the third row on primaries is either wholly yellow, or yellow with red edges, particularly on the outer side; on secondaries wholly red, and often very deep, so as to make a conspicuous broad band; the fourth row on primaries is red, sometimes with the spots next the two margins either yellow or in part yellow; around the end of cell yellow spots four or five in number; in the cell spots of red and yellow alternately, four in all, the yellow one at base more or less stained red; two yellow spots below cell with black ground between, and nearer base a small duplex red one; the fourth row on secondaries is yellow, either of small spots or pretty large ones, and the three or four from costal margin are red on their outer sides; a red stripe outside the cell from the end to costal margin; two small yellow spots inside cell, with a red one between them and a yellow spot below; fringes yellow, black at the tips of the nervules. Some examples have scarcely any yellow, the yellow having been replaced by red, or tinted red.

Under side of primaries red, the yellow spots repeated, enlarged, and

of clear color; outside end of cell a large suboval red spot heavily edged black, and the cell is crossed by two wavy black lines.

Secondaries have the margins red, in a continuous band; the second row yellow, on black ground, lunate; the third row red, rounded on inner side and edged narrowly with yellow on all sides but the exterior; the fourth row yellow, cut unequally from one margin to the other by a black line; thence to base red; a triangular yellow spot at end of cell, and in a straight row from costal margin three yellow spots, one on margin and partly in costal interspace, one at top of cell, the third in lower median interspace. Sometimes the fourth row is expanded towards base along inner margin, giving the appearance of a fourth spot to the basal row; the shoulder and edge of costa yellow.

Body above black; red hairs on collar; thorax beneath yellow; abdomen red at sides, yellow along venter, red at end; legs red; palpi red; antennæ pale red-brown, annulated whitish above, red below, club black on upper side, the tip ferruginous, elsewhere red-brown.

Female.—Expands from 1.7 to 2.2 inches.

Like the male in general, but the spots larger in proportion; on the underside, the spots of second row on each wing are large, lanceolate, the outer side deeply incised. In occasional examples the outer part of upper side of secondaries is covered by a broad red band in place of the spots of second and third rows, and this area is separated from the narrow marginal band by a black line.

In an aberration there is no trace of yellow on upper side, and on the under side of secondaries the yellow bands from margin to cell are replaced by wood-brown, while the yellow basal spots are obscured.

I name this species *Augusta*, in memory of the late Mrs. W. G. Wright. Mr. Wright has taken it in vicinity of San Bernardino abundantly, and writes of it thus: "*M. Augusta* is found on top of the mountains, elevation 5,000 feet, and is not found at all till you reach the top. They do not descend the mountain sides, nor are they found in the canyons. On the summit oak and pine trees are scattered, and the ground is covered with grasses and flowering plants. The butterfly seems all the time on flowers, and is a great feeder. I have never seen a

pair in copula, nor a female ovipositing, and I know nothing of the early stages. Every year I find *Augusta* at the same place, in the month of June."

It seems to me probable that *Augusta* will be found in Utah and Arizona, perhaps also in Nevada.

TENTHREDINIDÆ COLLECTED AT OTTAWA, 1889.

BY W. HAGUE HARRINGTON, OTTAWA.

The past season was not a favorable one for the collection of Hymenoptera. The early spring was very fine and warm, but was followed by prolonged spells of cool and rainy weather, which not only made collecting difficult, but appeared to destroy many of the insects. This will be seen by the following list, in which a large proportion of the species are represented by single specimens. It contains about eighty species, or nearly two-thirds of those that have so far been taken in this locality.

Few of the species were at all common, the most abundant and destructive being *N. Erichsonii* Hartig., which we now find wherever there are larches, and by whose larvæ these trees are defoliated and injured. *N. Ribesii* Scop. *(ventricosus* Hartig.), the gooseberry saw-fly, and *H. maculatus* Norton, the strawberry saw-fly, were also numerous. On the other hand several of the species, especially of Macrophya and Tenthredo, which are usually common in midsummer, were not observed, and there was a noticeable scarcity of larvæ.

Cimbex americana Leach, var. *decemmaculata* Leach, female, June 16.
var. *La Portei* St. Farg., male, May 11.
Trichiosoma triangulum Kirby, male, May 12.
Abia Kennicotti Norton, female, May 11.
Hylotoma clavicornis Fabr., female, June 13.
McLeayi Leach, female, May 10.
Priophorus æqualis Norton, female, July 14.
Pristophora identidem Norton, male, May 27 ; male, June 16.
tibialis Norton, female, May 12 ; female, June 26.
Euura orbitalis Norton, three females, May 24.
Nematus aureopectus Norton, female, May 9; two females, May 10; female, May 18 ; female, May 27.

bivittatus Norton? female, May 11.

corniger Norton, male, May 17; male, May 24; male and female, May 27; female, June 2; male, June 16; male, Aug. 8.

Erichsonii Hartig., female, abundant from May 19; male, June 15.

latifasciatus Cresson, female, June 7.

malacus Norton, female, May 18.

mendicus Walsh, one male and two females, May 9; female, May 17; female, June 26.

pleuricus Norton? female, May 9.

Ribesii Scop., female and male, common, May, June.

Several species not yet examined, May, June.

Emphytus apertus Norton, female and male, May 17; female, May 18; female, May 27; female, Aug. 8.

hullensis Prov., female, June 23.

mellipes Norton, male, May 11; female, May 24.

Harpiphorus maculatus Norton, male and female abundant, May 9 to June 26.

Dolerus albifrons Norton, seven males and two females May 24.

aprilus Norton, male and female, May and June, common.

arvensis Say, female, April 19, May and June, common.

bicolor Beauv., female, May 27.

collaris Say, female, May 10; female, May 19; female, June 2.

unicolor Beauv., male, May 12.

Monophadnus bardus Say, female June 13.

medius Norton, two females, May 11; female, May 18; female, May 24; two females, June 13.

rubi Harris, female, May 12; female, May 27.

Phymatocera canadensis Harrington, female, May 10; female, May 11; female, May 17.

fumipennis Norton, four males and three females, May 17; female and male, May 18; female, May 20; two males, June 22.

Hoplocampa halcyon Norton, female May 11; female, May 17.

Monostegia ignota Norton, two males and one female, May 27.

rosæ Harris, female, May 19; female, May 22; female, May 24.

Selandria flavipes Norton, two males, May 24; male and female, June 2; female, June 8; male, June 13; two females, August 8.

Allantus basilaris Say, female, June 28; male, July 28.

Macrophya externa Say, female, June 26.
flavicoxæ Norton, female, June 13; female, June 23; two females, June 26; two females, June 28; female, July 1.
varia Norton, female, June 20.
sp. female, June 26.
Pachyprotasis dĕlta Prov., male, June 16; female, June 20; one male and two females, June 23; two females, June 30.
omega Norton, male, June 28; male, July 28.
Taxonus albidopictus Norton, female, July 14.
amicus Norton, male, June 16; male and female, June 26.
rufipes Harrington, male, May 18.
unicinctus Norton, female, May 27.
Strongylogaster annulosus Norton, female, May 24.
apicalis Say, female, June 13; female, June 28; male, July 11; female, July 28.
longulus Norton, male, May 24.
luctuosus Prov., female, May 22.
robustus Prov., ? female, June 13; two females, June 28; male, July 1.
soriculatus Prov., female, May 24.
tacitus Say, male, May 24; female, June 8; male, August 8.
Tenthredo eximia Norton, male, May 24; female, June 28.
grandis Norton, female, June 15.
mellina Norton, female, July 7.
ruficolor Norton, female, May 24; female, July 1.
rufipes Say, female, June 2; female, June 23; two females, June 26.
rufopectus Norton, male, June 14; male, June 16; female, June 26; male, July 1.
verticalis Say, female, June 13; female, July 1; female, July 14.
Tenthredopsis atroviolacea Norton, female, June 16; female, June 30.
Lophyrus Lecontei Fitch, two females, (bred) May.
Monoctenus fulvus Norton, one male and two females, May 13.
Lyda canadensis Norton, female, June 26.
luteicornis Norton, female, June 2.
luteomaculata Cresson, female, May 24.
perplexa Cresson, male, May 11; male, May 17.
quebecensis Prov., female, June 30.

THE NOCTUIDÆ OF EUROPE AND NORTH AMERICA COMPARED.

(Fifth Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

Tribe *Orthosiini.*

The vestiture is woolly, and in this lies a distinguishing character from the *Agrotini* and *Hadenini,* which some genera much resemble, while the body is hardly tufted; the rather broad thorax has sometimes a median ridge. The colours of the moths are often shades of brown, red and yellow, like the autumn foliage, in which many of the hibernating species hide. The eyes of the first genera are hairy; in several the tibiæ are spinose, the reverse being usually the case. Whether our, mostly western, species allied to *Perigrapha cincta* are strictly congeneric, I have not been able to decide. *Acerra normalis* has simple antennæ in the male; the ornamentation in most cases suggests the relationship. There are two European species of *Perigrapha* against seven related North American species. The genus *Tæniocampa* has twenty-two described American species and only eleven European; among these is one, *alia,* identical. I have not a particle of doubt that for this genus the term *Graphiphora* Hübn., must be retained. My efforts to place the generic nomenclature upon a final basis, by fixing the types in 1874, has met with thoughtless opposition and incorrect criticism. The question of whether Hübner, or others,held our modern (supposed by empirics infallible) ideas upon genera, is quite beside the question of the oldest and therefore proper name for a genus. I have exposed this sort of reckless criticism in the second part of my Check List, 1875, 1876. Only my desire to avoid contention and to enable a comparison of our fauna by the use of the same terms, has induced me to cede the present instance, because the name *Graphiphora* taken from Hübner (to whom we owe almost *all* the leading generic names in the Noctuidæ), had been mis-applied. I think, now, I may have been wrong in this, and that *Graphiphora* should be used, as I originally proposed, with the type *Gothica,* and *Tæniocampa* rejected. Only in this way shall we obtain a stable nomenclature, and the European catalogues must conform, if nearer conclusions are to be arrived at, and lists are to be useful beyond a mere stringing of the different species.

The North American hairy-eyed genera allied to *Tæniocampa* are, further, *Crocigrapha*, with a tuft behind the collar; *Orthodes*, *Himella* and *Morrisonia* (the species of which latter curiously resemble *Actinotia*, but seem to hibernate, being found early in the year on sallows); while I have described American species belonging to the naked-eyed European genera *Parastichtis* and *Anchocelis*. Naked-eyed genera, with armed tibiæ, are *Pachnobia* and *Metalepsis*, occurring in both faunæ, and *Pseudorthosia*, *Choephora*, *Pseudoglaea*, which seem to be American only. *Trichorthosia*, which has hairy eyes, seems to be more allied to *Xanthia*, or *Orthosia*, in the shape of the wings; but, if we do not divide this tribe, as is perhaps unnecessary, it may be ranged with the other hairy-eyed genera, together with the somewhat aberrant *Trichocosmia*. The principal genus is, perhaps, *Orthosia*, of which fourteen European and seventeen American species are described, mostly of a European habitus, and one representative, *ferrugineoides*. While I have referred one identical species *(togata)* to *Xanthia*, which, as distinct from *Orthosia*, contains seven European species, the singular genus *Jodia* Hub. (=*Hoporina* Boisd.), has an American representative of *croceago* in *J. rufago* Hübn. *Eucirroedia* is a modification of the European genus *Cirroedia*; while the peculiar genus *Scoliopteryx* with its one species, *libatrix*, is common to Europe and America, from Hudson's Bay to Virginia, and is probably a survival of the former circumpolar fauna. *Glaea* Hübn. (=*Orrhodia* Hübn., *Cerastis* Tr.) has twelve European and only four American species, but the nearly related American genus *Epiglaea*, which differs from *Glaea*, much as *Richia* differs from *Agrotis*, by the presence, namely, of a median thoracic ridge, has five, and *Homoglaea* two described species. Our most beautiful species is *H. carnosa*, in which the egg is also pink in colour. *E. venustula* is said to be the same as *E. sericea*; if the description of the latter is compared, it will be seen to contradict that of *E. venustula* in important points, which remain incomprehensible if the two are really the same. The genera *Ipimorpha* and *Calymnia* have representative, the genus *Cosmia*, an identical species, *paleacea*. While there are a few peculiar genera in both faunæ, such as *Dicycla* in Europe, and *Zotheca* in America, the affinities of the two faunæ in this tribe are strongly marked. The peculiar genus *Scopelosoma* has in Europe one, in America nine species. Of these it is difficult to say which is nearest to the European *satellitia*; the identification of Guenée's *sidus*

is hence almost impossible; his type also cannot be found. In my opinion he may have had a form of *Walkeri* before him; but whether this, or *vinulenta*, or even *tri-stigmata*, or *Morrisoni*, cannot, with certainty, be made out from his comparative description. As I have separated all the American forms under distinct names, and Mr. Thaxter has shown the distinctness of most of them by breeding, these names should be retained until further evidence be forthcoming as to the single species indicated by Guenèe. A different course would be the result of mere opinion and, without scientific value, only make confusion.

Tribe *Calocampini.*

The vestiture resembles that of the preceding tribe, but the wings are narrower, the legs proportionately shorter, unarmed. The palpi are short; male antennæ thickly ciliate. The primaries are blunt, not widening outwardly as much as usual, with gray or brown, streaky, stone-like markings, hence the name *Lithophane*, used for the principal genus by Hübner. This genus is incorrectly called *Xylina;* Hübner's genus of this name having for type a species of *Hadena.* It seems to have been customary for earlier authors to take names out of Hübner's writings and apply them arbitrarily, with or without diagnosis. The injustice and absurdity of this proceeding must be evident to all thinking persons. Only an empiric, full of his own importance and wishing to elevate himself by contrast, can commit the blunder. If Hübner has not given neurational characters, it is because neurational characters were not then known; at least he has not given us incorrect descriptions of the venation, which is in his favor as compared with certain quite modern writers. *Lithophane* has eight European and about twenty-five American species; again a large preponderance. Of these, *Thaxteri* represents the European *lambda;* but no variety of the latter corresponds with our American form, which must be regarded as a distinct representative species accordingly. The European *ingrica* seems to be represented also by *pexata* and its variety *Washingtoniana*, although in the latter instance nearer comparisons are necessary, which I have not been able to make. *Lithomia* Hübn., which differs by the character of the palpal vestiture and the elevated collar, has apparently a representative species in *germana;* but I strongly suspect that this is really identical with the European *solidaginis.* *Calocampa* has

two European and apparently four American species, one of which is unknown to me; of the other three, *nupera* is said to represent the European *vetusta*, although perhaps identical with it; *cineritia* has the widest range, while both this and *curvimacula* are quite different from either of the European forms. The representation of this tribe in Europe is covered by the American forms.

Tribe *Cuculliini.*

The elongate wings are sharply pointed, the collar hood-shaped; the abdomen is tufted terminally and extends beyond the proportionately small secondaries. The European species (43) greatly outnumber the described American forms (11). There are a large number of closely related species in the European fauna, many of comparatively recent detection. Perhaps more remain to be described in North America, though it is probable that both this and the next tribe will show an excess of European forms. The specific groups seem to be represented in America. I do not know, however, *luna*, which appears to be allied to the European silvery forms. In addition we have a Californian species, *matricariæ* Behr. (= *serraticornis* Lintr), which has pectinated ♂ antennæ; I have doubted its being a true *cucullia.*

Tribe *Cleophanini.*

I have referred to *Cleophana*, two American species with hood-shaped collar and the facies of *Cucullia*, but with a claw to the front tibiæ. The other European genera, *Epimecia*, *Calopharia*, I have not recognized. *Nyctophæata* I believe to be a Heliothid form.

Tribe *Euteliini.*

In this tribe of smaller moths, the wings are more or less extended in repose, in the American genus *Marasmalus* folded like a fan. The small secondaries ally them to *Cucullia.* The antennæ have a basal tuft; the collar cut out behind, not hood shaped; the abdomen more or less tufted; the eyes naked. The American *Ripogenus pulcherrimus*, a rare moth, seems to be related to the European *Eutelia adulatrix.*

Tribe *Ingurini.*

The male antennæ are simple at tip. An American form coming to our fauna probably from the south. The form resembles the preceding tribe, but the wings are entire. The species of the single genus *Ingura* are small moths, resembling the species of *Abrostola* in ornamentation, except, perhaps, *oculatrix*, which is a pretty, singularly marked moth.

Tribe *Anomiini.*

Thinly or closely scaled untufted forms, with rather broad and pointed wings and slimy vestiture, the larvæ half loopers. *Anomis* has uneven margins to the primaries. *Aletia* (the "cotton worm") has them even, somewhat sickle-shaped. *Pterœtholix* and *Chytoryza* have peculiar clear spots and structure of the fore-wings. The tribe is American, and comes to our fauna from the south.

Tribe *Litoprosopini.*

Larger species with Plusia-like palpi, untufted, with brown wings, having curious ocellate markings and metallic points on secondaries. *Hatney* from Cuba, *confligens* from the west coast, *futilis* from Florida, all belonging to *Litoprosopus*, and are tropical American forms intruding into our territory in the south.

Tribe *Calpini.*

The fore-wings are wide, with pointed apices, full external margin, a tooth on inner margin. Eyes naked, lashed. Palpi prominent, hirsute to the tips, terminating bluntly as if cut off. A single genus and species in Europe, *Calpe capucina*, has apparently an American representative in *C. canadensis* Beth. I have not been able to study other genera, indicated by Guenèe and figured by various writers. This tribe would seem to be tropical in its origin. The genus *Calpe* probably belonged to the tertiary circumpolar fauna, and is of so pronounced a form that the American and European descendants have retained a decided resemblance. I do not know that *Canadensis* has been bred or carefully compared with its European ally, but I was able to recognize type specimens among Mr. Walker's synonyms and somewhat confusing generic references in this family. Full and careful comparisons are needed in many cases to decide whether the species are representative or identical.

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 14, Volume xxii.)

A. doris Bdv.

1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg.), 77, *Chelonia.*

Habitat—So. California.

I am not aware that any reference of this species to the rank of synonyms has been made. It refers almost certainly to one of our western species now known under another name. Mr. Grote has omitted the species from his list.

A. edwardsii Stretch.

1873—Stretch, Zyg. and Bomb., 74, 77, pl. III., f. 9, *Arctia.*

1883—Neum., Papilio, III., 149, =*achaia ?*

1887—Smith, Ent. Amer., III., 111, =*dahurica.*

Habitat—California.

A. excelsa Neum.

1883—Neum., Papilio, III., 70, *Arctia.*

1883—Hulst.,* Bull., Bkln. Ent. Soc., VI., 69, =*nais.*

Habitat—No. Car., New York, Long Island.

Food plant—Plantago major.

A. elongata Stretch.

1885—Stretch, Ent. Amer., I., 105, *Arctia.*

1885—Neum., Ent. Amer., I., 93, =var. *determinata.*

Habitat—Was. Terr.

The curious anomaly of a species being referred as a synonym before it was described arose from the fact that Mr. Stretch, basing his species upon Mr. Neumoegen's material, returned the specimens before sending in the papers for publication. Mr. Neumoegen, working on the genus, made the reference from the label, and both gentlemen sent in their papers for publication at nearly the same time.

A. figurata Drury.

1770—Dru., Illustr., II., pl. XII., f. 4, *Bombyx.*

1820—Pal., Beauv., Ins. Afr. et. Am., Lep., p. 265, pl. 24, f. 4, ♂, *Phalæna.*

1837—Westw., ed. Dru., Illustr., II., 22, *Nemeophila.*
1837—Harris, Cat. Ins. Mass., 73, *Arctia.*
1856—Wlk., C. B. Mus. Lep. Het. III., 625, *Nemeophila.*
1862—Clem., App. to Morris, Synops., 341, *Arctia.*
1865—Grt. & Rob., Ann. Lyc., N. Y., VIII., 368, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
1879—Graef,* Bull., Bkln. Ent. Soc., I., 3, life hist.
1883—Hulst., Bull. Bkln. Ent. Soc., VI.. 70, =*nais.*
1887—Smith, Ent. Amer., III., 114, an sp. dist.
ceramica Hbn.
1816—Hbn., Verz., 180, *Euplagia.*
1865—Wlk., C. B. Mus. Lep. Het., III., 625, pr. syn.
var. *franconia* Edw.
1887—Edw., Ent. Amer., III., 184, *Arctia.*
Habitat—Can., N. Y., Mass., Pa., Ills., D. C.

The distribution is undoubtedly wider, and, as certainly, some of the described species must fall in as forms of this.

A. flammea Neum.

1881—Neum., Papilio, I., 9, *Arctia.*
1883—Hulst., Bull. Bkln. Ent. Soc., VI., 70, =*nais.*
1883—Neum., Papilio, III., 149, =*placentia* var.
Habitat—Florida.

A. f-pallida Strk.

1879—Strk., Rept. Eng., 1878–79, v. V., p. 1860, pl. II., f. 3.
1883—Hulst., Bull. Bkln. Ent. Soc., VI., 70, =*nais.*
Habitat—Rio Navajo, Colo., July 13.

This is simply a variety of *figurata*, in which all the marking save those forming a distinct ⊔, are obsolete. Any good series of *figurata* will show such specimens.

A. geneura Strk.

1878—Strk., Proc. Dav. Ac. N. Sci., II., 270, pl. IX., f. 5, ♂, *Arctia.*
1884—French, Papilio, IV., 158, ♂, *Arctia.*
1889—French, Can. Ent., XXI., 162, *Arctia.*
Habitat—Colo. (Gilpin Co.), Mt. Shasta, Calif.

Mr. French seems rather inclined to believe that the California specimens may refer to a distinct species. There is a series of *geneura* in the

U. S. National Museum, and this species, *incorrupta* Edw., with all its variations and *nevadensis*, G. & R., are all forms of a single, not very variable species, of which *docta* is the Californian form, and perhaps specifically distinct. The material in the National Museum will go far towards settling the relationship of these forms. The description of new species would be therefore rather unwise until this material can be properly studied.

A. michabo Grt.

1875—Grt., Can. Ent., VII., 196, *Arctia.*
1883—Neum., Papilio, III., 150, =*arge.*
1886—Grt., Can. Ent., XVIII., 108, an sp. dist.
1887—Smith, Ent. Amer., III., 111, an sp. dist.
Habitat—Nebraska, Dist. Col.

A. nais Dru.

1870—Drury, Illustr., I., pl. VII., f. 3, *Bombyx.*
1816—Hübner, Verzeichniss, 183, *Arctia.*
1823—Hübner, Zutr,* 300, ff. 599, 600, *Arctia.*
1837—Westw., ed. Drury, I., p. 15, *Spilosoma.*
1856—Wlk., C. B. Mus. Lep. Het., III., 609, *Arctia.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 528, *Arctia.*
1862—Clem., App. to Morris Syn. 339, *Arctia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 177, *Arctia.*
1868—Grt., Trans. Amer. Ent. Soc., II., 117, *Arctia.*
1868—Saund., Can. Ent., I., 27, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
1876—Moeschl., Stett. Ent. Zeit., XXXVII., 296, *Arctia.*
1882—French,* Papilio, II., 176, life hist.
1883—Hulst., Bull. Bkn. Ent. Soc., VI., 69, 120, *Arctia.*
1884—Bean,* Can. Ent., XVI., 65, *Arctia.*
1887—Smith, Ent. Amer. III., 111, *Arctia.*
phalerata Harris.
1837—Harris, Cat. Ins., Mass., 73, *Arctia.*
1841—Harris, Rept. Ins., Mass., 245, *Arctia.*
1862—Harris, Inj. Ins., Flint, ed. 347, f. 166, *Arctia.*
1863—Saund., Syn. Can. Arct., 11, *Arctia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 177, *Arctia.*

1868—Grt., Trans. Amer. Ent. Soc., II., 117, pr. syn.
radians Wlk.
1856—Wlk., C. B. Mus. Lep. Het., III,, 632, *Apantesis.*
1868—G. & R., Tr. Am. Ent. Soc., II., 72, pr. syn.
colorata Wlk.
1864—Wlk., C. B. Mus. Lep. Het., XXXI., 302, *Aloa.*
1868—G. & R., Trans. Amer. Ent. Soc., II., 85, pr. syn.
1876—Butl., Journ. Linn. Soc., XII., 432, =*radians.*
var. *incompleta* Butl.
1881—Butl., Ann. and Mag., N. H., Ser. 5, v. VIII., 311, *Arctia.*
Habitat—Can., U. S., generally.

The species has been recorded as a strawberry feeder. Mr. Butler's variety refers to one of those forms with the maculation partly obsolete, such as any decent series will show. The synonomy of Walker's species has been already referred to. The reference is rather to *decorata* Saund. than to *nais* Dru., but I have not much doubt of the identity of the two forms. There is, however, a species closely allied to *nais* in the National Museum collection, which is, I believe, as yet undescribed.

A. nerea Bdv.

1868—Bdv., Lep. Cal. (Ann. Soc. Ent. Belg., XII.), 77, *Chelonia.*
Habitat—California.

This species has disappeared from our lists. It is perhaps only a variety of *arge,* but I cannot find that it has been so referred.

A. nevadensis Grt. & Rob.

1866—Grt. & Rob., Proc. Ent. Soc., Phil., VI., 1, pl. 1, f. 1, ♂, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
1885—Neum., Ent. Amer., I., 93, —gives synonomy.
1886—Grt., Can. Ent., XVIII., 109, *Arctia.*
behrii Stretch.
1873—Stretch, Zyg. and Bomb., 75, pl. 3, ff. 11 and 12, *Arctia.*
1873—Stretch, Zyg. and Bomb., 238, pr. syn.
var. *incorrupta* Hy. Edw.
1881—Edw., Papilio, I., 38, *Arctia.*
1883—Neum., Papilio, III., 71, 150, =*nevadensis.*
1885—Neum., Ent. Amer., I., 93, =*nevadensis.*
var. *sulphurica* Neum. Ent. Amer., I., 93, *Arctia.*
ochracea || Neum.

1883—Neum., Papilio, III., 71, *Arctia.*
1885—Neum., Ent. Amer., I., 93, *nomen bis lectum.*
var. *mormonica* Neum.
1885—Neum., Ent. Amer., I., 93, *Arctia.*
Habitat—Nevada, Arizona, Oregon, Calif.

As I have already indicated, I believe that *geneura* Strk. belongs to this series.

A. obliterata Stretch.
1885—Stretch, Ent. Amer., I., 105, *Arctia.*
Habitat—Unknown.

A. ochreata Butler.
1881—Butler, Ent. Mo. Mag., XVIII., 135, *Arctia.*
Habitat—United States.

Mr. Butler says his species is close to *phalerata*, and after carefully reading his description I believe he is right. At all events I cannot find anything in it that does not apply to *phalerata* as well.

A. oithona Strk.
1877—Strk., Lep. Rhop. et. Het., 131, *Arctia.*
Habitat—Texas.

This will turn out a remarkably close ally to *intermedia* Stretch, which *is not saundersii* Grote.

A. pallida Pack.
1864—Pack., Proc. Ent. Soc., Phil., III., 118, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
Habitat—New York.

The type is in the collection of the Am. Ent. Soc., where I have several times seen it. It is certainly not an *Arctia*, but perhaps nearer to *Seirarctia.*

A. phyllira Dru.
1770—Drury, Illustr., I., 15, pl. VII., f. 2, *Bombyx.*
1791—Oliv., Enc. Meth., V., 94, *Bombyx.*
1797—Abb. & Sm.,* Ins., Ga., II., 127, pl. 64, *Phalæna.*
1816—Hübner, Verzeichniss, 180, *Euplagia.*
1820—Hübner, Zutraege, *108, ff. 215, 216, *Euplagia.*
1837—Westw., ed. Drury, I., 15, *Callimorpha.*

1837—Harris, Cat., Ins., Mass., 73, *Arctia.*
1841—Harris, Rept. Ins. Mass., 245, *Arctia.*
1856—Wlk., C. B. Mus. Lep. Het., III., 610, *Arctia.*
1858—Wlk., C. B. Mus. Lep. Het., VII., 1780, *Arctia.*
1860—Clem., Proc. Ac. N. Sci. Phil., XII., 528, *Arctia.*
1862—Clem., App. to Morr. Synops., 339, *Arctia.*
1862—Harris, Inj. Ins., Flint ed., 347, *Arctia.*
1863—Saund., Syn. Can. Arct., 11, *Arctia.*
1876—Moeschl, Stett. Ent. Zeit., XXXVII., 296, *Arctia.*
1883—Hulst., Bull. Blkn. Ent. Soc., VI., 70, =*nais.*
1887—Smith, Ent. Amer., III., 111. an spec. dist.
var. *lugubris* Hulst.
1886—Hulst., Ent. Amer., II., 182, *Arctia.*
Habitat—Penn., N. Y., N. J., D. C., Can., Mass., Ills., Mo., Ga.

The distribution is wider—when the synonomy is once ascertained we can complete the record of occurences.

(To be continued.)

DESCRIPTION OF THE LARVA OF TRIRHABDA TOMENTOSA, L.

BY WM. BEUTENMÜLLER.

Body elongated, subcylindrical, rounded above and flattened beneath; color above steel blue, with a series of transverse elevated ridges along the dorsum, two on each segment, and along the sides are three rows of tubercles, all steel blue. Body beneath, dirty brownish white; cervical shield also steel blue.

Thoracic feet jet black, shiny; abdominal and anal legs wanting.

Head small, subglobose, depressed in front; shiny jet black.

Mandibles simple, short, stout, slightly excavate internally beneath the apex.

Maxillæ robust, cylindrical; lobe rounded at the apex with a few bristles; palpi three jointed; first joint short, second joint somewhat larger, cylindrical, third joint conical, extending a little beyond the lobe.

Labium subtriangulate, palpi two-jointed, very short.

Antennæ very minute, hardly visible.

Length, about .10 mm; width, about .3 mm.

Food-plants, various species of golden rods and asters. June; single brooded.

NOTES ON THE INSECT FAUNA OF HIGH ALTITUDES IN CUSTER COUNTY, COLORADO.

BY T. D. A. COCKERELL, WEST CLIFF, CUSTER CO., COL.

The faunæ of high altitudes always possess a peculiar interest by virtue of the light they throw on problems of geographical distribution, and especially the distribution in ancient times of what is now a strictly Arctic and Alpine fauna. For this reason, the following lists of species, fragmentary as they are, may be of some value as a contribution to our knowledge of the Alpine fauna of Colorado, and for comparison with Arctic and Alpine faunæ in general. The species here enumerated were taken in 1887, 1888 and 1889, on the eastern slope of the Sangre de Cristo Range, in Custer County, Colorado. Three gulches have been explored, namely, (1) Smith's Park Gulch, on a fork of Brush Creek, (2) Horseshoe Bend Gulch, the next gulch south of No. 1, and (3) Swift Creek Gulch. The great majority of insects came from Smith's Park Gulch. The altitudes are from 10,000 to 12,000 feet. A large number of insects were taken about the Micawber Mine, which is possibly not quite 10,000 feet; but it cannot be far from it, so the species are included. A list of the fauna and flora of the same part of Custer County, *below* 10,000 feet, is now in course of publication in the "West American Scientist." A comparison of the two lists will show that the fauna of higher altitudes differs very materially from that of the valley:—

COLEOPTERA.

These have been kindly identified by Dr. John Hamilton. They are classified according to locality and date of collection:—

(1) Near Brush Creek, June 26 and 27, 1889—

Dolopius lateralis Esch.
Podabrus lateralis Lec.
Orsodacna atra var. *childreni* Kirby.
Cicindela longilabris Say.
Acmæops proteus Kirby.
Adoxus vitis L.
Dichelonycha backii Kirby.

O. childreni and *D. backii* were common. *A. vitis* had the thorax black, and elytra reddish-fulvous.

(2) Near Micawber Mine, 1889—
Chrysobothris trinervia Kirby. A small example.
(3) Horseshoe Bend Gulch, August 15—
Chrysomela continua Lec. Many specimens on flowers of *Gymnolomia multiflora.*
(4) Near Micawber Mine, Aug.—
Lachnosterna sp. ♀ (fragment).
Coccinella transversoguttata Fald.
Trichodes ornatus Say.
Buprestis nuttallii ? (flying by day; not caught).
(5) Micawber Mine, Aug. 7, 1889—
Acmæops pratensis Laich.
Adoxus vitis L.
Zeugophora abnormis Lec.
Anthobium sp.
Mordella melœna Germ.
Leptura propinqua Bland.
" *subargentata* Kirby.
Anaspis rufa Say.
Homalota sp.
Mordella scutellaris Fab.
(6) Smith's Park Gulch, Aug. 5—
Cardiophorus tenebrosus Lec.
(7) Near Micawber Mine, Aug. 4—
Leptura propinqua.
Athous ferruginosus Esch.
(8) Timber line above Smith's Park Gulch, Aug. 5—
Dasytes hudsonicus Lec.
(9) Near Micawber Mine, Aug. 6—
Phyllotreta pusilla Horn. n. sp.
Hippodamia convergens Guér.
Glyptina atriventris Horn, n. sp.
Platystethus americanus Erichs.
Leptura propinqua Bland.
Adoxus vitis L.
Leptura subargentata Kirby.

HYMENOPTERA.

All the Hymenoptera have been submitted to Mr. W. H. Ashmead. The types of the new species are in his collection, and will be described by him.

(1) Near Brush Creek, June 27, 1889—

Bombus rufocinctus Cr
Prosapis basalis Smith, ♂.
Oryssus occidentalis Cr.
Rhodites spinosellus Ckll., n. sp.
Limneria tibiator Cr.
Odynerus leucomelas Sauss.
Macrophya albipictus Ashm., ♂, ♀.
Camponotus sp.
Orthocentrus leucopsis Ashm.
Eurytoma diastrophi Welsh, ♀.

Of *R. spinosellus* only the round pickly leaf-galls were found.

(To be continued.)

CORRESPONDENCE.

CHRYSALIDS DEVOURED BY CATERPILLARS.

Dear Sir: A few days ago I found a number of *Pyrameis cardui* larvæ, and also several (4) of the common, reddish brown, hairy caterpillars (*Spilosoma Isabella*), so often seen about gardens in the fall feeding on plants of the common garden hollyhock (Altheæ rosea). Not having extra boxes to spare, I placed both species in a roomy pasteboard box, with a plentiful supply of hollyhock leaves. In the course of a day or two several of the *cardui* larvæ hung themselves to the corner of the box, and in a short time three were transformed to chrysalids. What was my surprise on looking into the box this morning to see if any more had hung or transformed, to find the reddish brown caterpillars had devoured two of the *cardui* chrysalids, and one of the caterpillars was actually engaged eating the third, and had consumed fully one-half of it. This was not done from lack of food, as there was an *abundance* in the box. Here, then, is a new source of destruction to our butterflies—a sort of cannibalism among caterpillars.

Shelly W. Denton, Wellesley, Mass.

EREBIA EPIPSODEA VAR. SINE-OCELLATA Skinner.

Dear Sir: Is not this variety (CAN. ENT., p. 239) identical with var. *brucei* Elwes, (Trans. Ent. Soc. Lond., 1889, June, p. 326), described as smaller, without ocelli, the red band almost obsolete? *Brucei* was described from high altitudes in Colorado, so it is interesting to have it reappearing at lower levels in N. W. Ter. Mr. W. H. Edwards has kindly sent me the *Epipsodea* plate of his Butt. N. A., whereon are beautiful figures of *Brucei* and the early stages of the species.

Dec. 16, 1889. T. D. A. COCKERELL, West Cliff, Custer Co., Col.

GRAPTA INTERROGATIONIS.

Dear Sir: I beg to record the capture by myself of a beautiful specimen of *Grapta interrogationis* at Cote St. Antoine, Montreal, on the 11th of July. Its sluggishness and perfect condition showed that the insect had but just emerged from the chrysalis. *G. interrogationis* is extremely rare in the Province of Quebec. Tradition says that it had been, once upon a time, taken at Lachine—a few miles away; but for twenty-five years I have looked vainly for it.

South Quebec, Oct. 16, 1889. THOMAS W. FYLES.

THE CORN SAW-FLY.

Dear Sir: The occurrence in America of *Cephus pygmæus* Curtis, known in England as the Corn Saw-fly, may be worth a special record. In 1887, among insects taken by sweeping in a meadow, I found a *Cephus* not agreeing with any of the described American species. Mr. Ashmead has fully identified it as *C. pygmæus.* In some Hymenoptera received from Mr. VanDuzee a few days ago, I find three specimens, all females, and taken at Buffalo—two on 9th June, 1888, and the other on 11th June, 1889. This shows that the occurrence of the species is not accidental, and that it is already widely distributed. Possibly next season we may hear of injuries inflicted by it upon wheat fields.

W. HAGUE HARRINGTON, Ottawa.

Mailed February 4th.

The Canadian Entomologist.

VOL. XXII. LONDON, MARCH, 1890. No. 3.

POPULAR AND ECONOMIC ENTOMOLOGY.

THE MEDITERRANEAN FLOUR MOTH (*Ephestia kühniella*, ZELLER).

BY JAMES FLETCHER, OTTAWA.

During the summer of 1888 considerable anxiety was caused amongst North American millers by the alarming intelligence that the small Pyralid moth, bearing the name given above, had made its appearance in one of our large Canadian milling centres. There are two or three well-known insects which attack manufactured cereal products; but none of these, have ever occurred in injurious numbers in Canada. When, therefore, it was learned that a large warehouse, twenty-five feet wide, seventy-five feet deep and four stories high, had been completely over-run by the caterpillars of a new insect, which had infested all the flour and other manufactured foods therein contained, and had rendered much valuable machinery temporarily useless, it naturally caused much excitement lest the pest should spread to other mills; nor did this excitement abate when it was announced that the new comer was the same species as had been causing so much loss and trouble in English and European mills during the last ten years. The attack was so severe that it became necessary to close the mill where the outbreak occurred, and also to destroy a large quantity of goods. The insects in all stages were to be found in every part of the building. The cocoons were found adhering to the walls, joists, shelves and ceiling. Every crack or nail hole in the wood-work, machinery and furniture throughout the whole building was found to contain caterpillars or cocoons, and the moths were flying about in thousands. The attention of the Ontario Government was called to

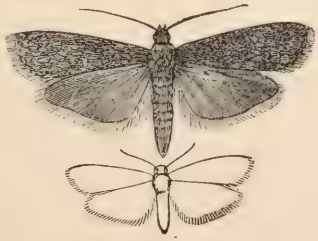

FIG. 2.

the matter in August last, and, under instructions from the Hon. Charles Drury, the Minister of Agriculture, prompt and vigorous steps were taken by Dr. P. H. Bryce, Secretary of the Provincial Board of Health, to ensure the extermination of so dangerous a visitor, which has been described as "the scourge of the Mediterranean ports." Dr. Bryce's investigations and the methods he adopted have been published in Bulletin I. of the Provincial Board of Health. This pamphlet, which is written in a clear, intelligible manner, and is illustrated with figures* of the insect in its various stages, will certainly be of great use to millers in showing them how to recognize and wage war against the insect should they meet with it upon their premises. Other valuable sources of information on this subject are Miss E. A. Ormerod's article in her Twelfth Report (pp. 66-72), and Prof. Riley's article in "Insect Life" (Vol. II., pp. 166-171). The object of the present note is to draw the attention of our readers to the subject, so that the gravity of the case may be recognized and prompt advice sent either to our Society or to the Ontario Government in case of further outbreak occurring in other parts of the Province. The perfect moth is a slender species about half an inch in length, with the wings folded close to the body when at rest. The upper wings are of a leaden grey colour, more or less sprinkled with black scales and crossed by three waved dark lines, two near together at the tip and the other a little nearer the shoulder than the middle of the wing. Just beyond the middle and in the centre of the wing is a black dot (sometimes two). The under wings are greyish-white, edged by a dark line, and all the wings are conspicuously fringed. The eggs, which are about $\frac{1}{40}$ of an inch in length, are oblong, bluntly rounded at the ends, or sometimes rather kidney-shaped. Under the microscope they are pretty objects, being covered with rather large but indistinct star-shaped prominences, the rays (or wrinkles) of which are waved. As a rule the eggs are laid singly, but sometimes in strings of from three to fourteen, connected at their ends. In nature they are probably laid on the outside of sacks, or are possibly pushed in between the meshes by means of the long ovipositors of the females. One female confined in a glass bottle closed with a plug of cotton batting had forced her eggs into the cotton plug to a depth of over $\frac{1}{4}$ of an inch. When first laid the eggs are greenish-

*Fig. 2, showing *E. kuhniella* enlarged, and of the natural size in outline, is kindly lent by Dr. Bryce.

white, after about twelve days they turn purplish, and in nineteen days (in September and October) the young caterpillars eat their way out of the eggs.

When first hatched they are reddish-brown, with dark heads, slender, hairy, and very active. They at once begin to spin a silken thread wherever they go. When full grown the caterpillar is three-quarters of an inch in length, slender and cylindrical; of a greenish-white, but pink where the skin overlaps. The head is reddish-brown. Upon the segment next to the head, and on the last segment, are two chitinous plates of a honey-yellow colour, known, respectively, as the thoracic and anal shields. Along the sides of the body are four rows of dark piliferous tubercles, the most distinct of which are those upon segments 2, 3 and 13. These tubercles are arranged in four series, as follows:—Subdorsal (two on each segment, from 5 to 12), lateral, substigmatal, and supraventral. The substigmatal series is double throughout, each tubercle bearing two bristles, separated a little at the base. On segments 3, 4 and 13 the subdorsal and lateral series are represented by a single double tubercle instead of two separate tubercles, as on the other segments.

These tubercles are small but distinct, the dark colouring is in the form of a cloud round the bases of the bristles. On the anterior section of segment 13, the two subdorsal rows of tubercles are joined by a dark cloud, and there is a large double conspicuous tubercle in the lateral area, When full-grown the caterpillars crawl to some crevice or corner and enclose themselves in close cocoons, into which they spin particles of flour dust, or any other material at hand. The chrysalis is honey-yellow at first, but turns darker as the moth matures within it. In about three weeks the moths appear, pairing takes place and eggs are laid within 24 hours.

Remedies.—As to remedies, these will have to be applied according to circumstances. In the attack above referred to, all machinery was brushed and subjected to a blast of super-heated steam. Fumigation, with sulphur and chlorine, was also resorted to. The experience of all who have had the misfortune of being visited by this pest is, that the only safeguard is scrupulous cleanliness. In Canada, where we have several months consecutively of severe winter weather, there should be no very great difficulty in keeping this pest down if millers will only recognize the danger of being indifferent. It is hardly probable that cold will kill

the insects if they are left undisturbed in their silken tunnels ; but, if these are broken by constant sweeping, and the caterpillars are left exposed, cold will certainly injure them. Moths and caterpillars placed in a glass bottle, and exposed to a temperature of five degrees above zero (Fah.), were all severely crippled, and did not recover. The above facts suggest the advisability of occasionally opening mills, which are supposed to be infested, so that the cold of winter may penetrate. If the moths are seen about in spring, fumigating with sulphur at short interval must be practised. Old sacks received from outside sources should be carefully examined, as these would probable be the most frequent means of carrying the pest from one mill to another. It is probable that this insect passes the winter in the caterpillar state, in which it is more or less active, according to the temperature.

SOME NEW COLORADO MOTHS.

BY G. H. FRENCH, CARBONDALE, ILL.

Cossus Brucei, nov. spec.

Expanse, male 2.50, female 3.00 inches.

Ground color, very pale gray, almost white, no dusky shading over the wing. Fore wings crossed by a great number of fine black lines. In the male none of these form reticulations except a few along the basal half of the internal vein and near the outer margin. The female has a few more of the reticulations in the outer third of the wing. On the male one line more prominent than the rest crosses the wing through the middle from the costa to the posterior margin at the origin of the fourth median vein, forming a straight line. On the female this line follows the fourth median vein about a tenth of an inch, and then goes in a straight line obliquely to the margin, and is not so heavy as in the male. Both sexes have a subterminal line not quite so prominent as the median, from near the apex to the posterior angle, bifid on costa, nearly straight in the male, slightly curved outwardly in the female, reaching the angle in a fine line. Veins dark only as denuded. Hind wings, with a space at the base and along

the inner margin, covered with long hairs as usual, the rest reticulated ; of the same color as the fore wings.

Head gray, darker in the male ; colar slightly more buff tinted than the ground color of the wings, making a light drab, without marks : thorax gray, a mixture of the ground color of the wings and black, a black line round the posterior margin preceded by a space devoid of black : abdomen of a lighter gray than the thorax. Beneath the thorax and abdomen concolorous with the same parts above, the legs ringed with light.

This species is nearest to *Cossus Angrezi* Bailey, but differs from that in several particulars. It lacks the dark shading on the fore wings, in the shape and distinctness of the transverse median line on fore wings, and in the shape and position of the subterminal line. The fore wings are a little less rounded at the apices, otherwise they are shaped alike. The hind wings in this species are reticulated over the terminal two-thirds, while in *Angrezi* the reticulations do not cover quite half. In *Angrezi* the thorax is black, with the edge of the tegulæ shaded with yellowish gray ; in this the thorax and tegulae are both gray. The antennæ are pectinated in both sexes, most heavily so in the male. The under side of the wings repeat the markings of the upper side, but a little blurred. The space between the two transverse lines is a little shaded with brownish. The female has the ovipositor exserted about .30 of an inch.

Described from two examples, one of each sex, taken by David Bruce, in Colorado, in 1887, and in the name dedicated to him.

Tolype distincta, nov. spec.

Expanse, male 1.12½, the female 1.50 inches.

Male.—In color and markings between *Velleda* and *Laricis*, rather a dark leaden gray ; the fore wings crossed by two geminate lines and a subterminal line, similar to those of *Velleda*, but the subterminal line is also inclined to be geminate. These lines are lighter than the ground colour, but not white as in *Velleda*. The geminate lines bordered each side by a shade line that is slightly brownish ; fringes concolorous, a whitish gray line at the base. Hind wings nearly the color of fore wings, a pale shade through the middle and at the outer border ; fringe like that on fore wings.

Head and thorax gray, the front a little mixed with brown, the middle of thorax with the usual glossy brown scales in the form of a longitudinal crest ; abdomen gray, brown tinted, the sides at the base white, beneath a little paler than above ; antennæ strongly pectinate.

Female.—Color and markings as in the male, the bands and veins a little more decided in contrast of color with the wings. Thorax dark leaden gray, patagiae rather lighter gray than the wings ; the entire absence of white anywhere.

This species is between *Velleda* and *Laricis* in size, as well as markings and colour. The antennæ are strongly pectinate, more so than *Laricis*, but not so much as *Velleda*. There is no decided white on either sex, except on the sides of the abdomen of the male, the cross bands and veins of the fore wings being whitish gray. The fringe of the fore wing show a tendency to be paler at the ends of the veins, but they are not pale externally, as are those of *Velleda*.

Captured by Mr. David Bruce, in Colorado, and described from two males in my cabinet, and one female in that of Mr. Bruce.

Halisidota occidentalis, nov. spec.

Expanse, 1.30 inches.

Fore wings hyaline, except the anterior part to subcostal vein, the base, and the posterior part along the submedian vein and a little above that at the base. The costal space alternately four patches of yellow, between a buff and a chrome yellow, and yellowish brown ; the posterior margin alternately two spots each of the yellow and brown, the basal yellow and the terminal brown spots the longest. From the costal brown spots three irregular sub-hyaline brown bands extend across the wing, the two outer connecting with the two brown spots on the posterior margin, the third from the outer margin not reaching the margin but blended posteriorly with the second ; the sub-basal brown spot on the costa is in line with a red-brown spot on the median vein at base ; the subhyaline brown, is darker than that on the costa. The hyaline spaces left between these brown bands corresponds to the light bands in such species as *Agassizii*, etc. Veins brownish yellow, as also the extreme outer portion of the wing. Hind wings hyaline, immaculate ; fringes of both wings pale.

Head pale yellowish brown, a yellow transverse stripe in front, antennæ

pectinate, pale yellow-brown. Thorax yellow buff; collar, a dorsal line and a line on outer edge of patagiae brown, the edge of collar next to head yellow; abdomen yellow; beneath pale yellow, with the front of anterior legs brownish.

Described from one male taken by Mr. Bruce, in Colorado.

Halisidota subalpina, nov. spec.

Expanse, 1.55 inches.

Fore wings yellow-buff, so sprinkled with brown scales as to appear quite brown, crossed by six rows of spots that are part yellow and part white, all except the costal surrounded by a brown annulus. The first row is of two spots, the first on costa and the second on median vein, all yellow; the second row is of three, the first large and at right angles to the other two very small white ones; the third row is of five spots, the costal yellow, the next three white, the second very small, the third and fourth equal, the fifth yellow and lacking the basal part of annulus; the fourth row is of five spots, the costal yellow, the second large and in the cell white, the third a brown spot, the other two small, white; the fifth row of six spots all white except the costal, the first and second only separated by the vein, the sixth very small; the sixth row is of nine spots, all white but the costal, the first, second and ninth very small, the seventh and eighth tending to fuse, the ninth removed inward out of line with the others. The last spot in four of these rows is below the submedian vein. Fringes brown, with buff at the ends of the veins. Hind wings pale buff, a pale stain spot at the end of cell and at the apex.

Head yellow in front, brown between the antennæ, antennæ pale yellow brown; collar buff, a central line and a spot each side brown; thorax buff, a brown line each side of the centre; centre of patagiae pale buff, with a brown line each side, the two uniting in front; abdomen buff. Beneath similar to the upper but paler, the abdomen with a central and lateral brownish stripe, the costa of hind wings with three brown stains.

Collected in Colorado by Mr. David Bruce. Described from one male. This species is near *H. Scapularis* Stretch, but differs in size, colour and markings. In *Scapularis* all the spots are white, and the ground color is brown, with the thorax brown instead of buff. These are a few of the differences between the two species.

NOTES ON EREBIA EPIPSODEA, BUTLER.*

Epipsodea was first known to me by examples taken by Mr. T. L. Mead, in Colorado, 1871. He says, in Report of the Wheeler Expedition: "This species inhabits the mountains of Colorado below timber line. Specimens were brought from Fairplay by the Expedition. It begins to appear about the first week in June, is common by the middle of that month, and remains until the last of July."

Several examples were received in 1883, by Mr. William M. Courtis, from Judith Mountains, Montana, at about 4,000 feet elevation, in July. From Mr. Ernest Stevenson, at Walla-Walla, southeast Washington, came some unusually large specimens, late in June, 1885; others from Spokane Falls, in east Washington, by Dr. W. J. Holland. I have also received this species from St. Michaels and Nushagak, Alaska; and have received eggs from Mr. Thomas E. Bean, at Laggan, Alberta. On the other hand, I have not seen *Epipsodea* from south Colorado, or New Mexico, or Arizona, or Utah, nor from the Sierra Nevada range anywhere. So far as appears, it is confined to the Rocky Mountains from middle Colorado northward to the Arctic sea, but flies over the lowlands in its northernmost range, and may there have a wide distribution. Many examples from Colorado are small, the wings expanding less than any seen from Alaska; and the largest have come from Washington. Throughout its territory the two principal varieties seem to be found, the banded and not banded.

Mr. Butler described the species from two individuals "from Rocky Mountains," but the locality was not stated.

Mr. Bruce writes: "I first met with *Epipsodea* in Platte Canon, Colorado, at about 9,000 feet elevation. It frequents damp and boggy places where the grass grows rank and coarse. In such situations, up to nearly 12,500 feet, I found it rather common. In one place, at the highest altitude named, a small stream of muddy water from a mine had been conveyed in wooden troughs which emptied into a basin-like depression; in this place, being always moist, the grass and flowers grew luxuriantly, and many species of butterflies were in profusion. *Epipsodea* was plenty, and in almost all the examples I captured here, the ocelli on

*From Edwards's Butt. N. A., Vol. 3, Part IX., issued Feb. 1, 1890. As comparatively few of our readers are likely to see this work, we have thought it worth while to reprint these interesting notes.—Ed. C. E.

upper wings were absent. Many had none on lower wings, others showed black points more or less minute.

"This variety, which Mr. Elwes has called E. Brucei I see, is probably peculiar to these high stations, where I have found it during three seasons, for, in the valley below, there was a narrow, boggy tract, more than a mile long, where *Epipsodea* was plentiful; but I found none of the variety spoken of. The only variation there was marked by the absence of the band on under side hind wings, and this was confined to few individuals.

"*Epipsodea* has a rather quick, jerky flight. It is not very readily captured, for, although it never appears to be in a great hurry, it flies close to the ground, and is always just ahead, dodging under every bush, and around every grassy hummock, as if in earnest search for something. It takes long flights without going far away, and seldom alights on flowers. Directly the sun is obscued, it dives in the grass, like almost all the mountain diurnals. All the Erebias, as well as the alpine species of Chionobas, 'play possum,' and pretend to be lifeless when captured, and will lie in or under the net, or on one's hand, some moments in that condition. I have found *Epipsodea* from June 9th to the end of August, in the front Range, in Colorado; at the latter date it was badly worn."

Mr. Elwes says, Tr. Ent. Soc., Lond., 1889, Part II, p. 334: "I have a single specimen, and Mr. Godman has a similar one, collected by Bruce in Cashier Valley, Summit County, Colorado, at 12,000 feet, which are considered by Bruce and W. H. Edwards to be a variety of *Epipsodea*, though it is so different from it that, had I more specimens, I should be inclined to consider it a different species, more especially as *Epipsodea* does not appear to extend to such great elevations, or to vary much; though its range of altitude is very great. I have taken it in Idaho at about 2,000 feet elevation, and in the Yellowstone Park at 5,000 to 6,000 feet, and have it from Colorado, taken by Bruce, as high as 9,500 feet. The specimens above mentioned are somewhat smaller, and with rounder wings, than the average of *Epipsodea*, but are best marked by the entire absence of ocelli on either wing or on either surface, and the partial disappearance of the red band." In the Synopsis of same paper, page 326, Mr. Elwes puts this under the species name as "? Var. Brucei."

Mr. Bean writes: "At Laggan, *Epipsodea* is moderately common in June and early July, frequenting open, grassy flats of the Bow River valley,

at an altitude of about 5,000 feet. It is, in my experience, rarely found on the mountains, but I took a single male, the past seaon on a mountain ridge, at 7,800 feet, or about 500 feet above the tree line. This specimen does not differ from those of the valley, 3,000 feet below. The form you mention *(Brucei)*, which partly lacks the eye spots, I do not find.

"*Epipsodea* occurred at McLean, altitude 1,900 feet, in 1884, though not so common as it is at Laggan, and the localities were open grassy flats."

The eggs sent me by Mr. Bruce, in 1888, were laid by a female of this var. Brucei, not wholly destitute of spots, there being two or three black points on fore wings. The outcome was a single male, true type *Epipsodea*, scarcely banded beneath, out of chrysalis 12th May, 1888. The eggs were laid 8th July and hatched 20th. On 25th, there were seven young larvæ. The first one passed first moult 27th July, the second moult 4th August, the third moult 28th August. The others lingered in their stages, but by 15th September, five had passed third moult. They were at all times kept out of doors, and cool weather now coming on they ceased feeding gradually. On 29th October, I found but three larvæ, all in lethargy, two of the five having disappeared. In November, I took them to Clifton Springs, as before stated. On 5th April, 1888, I received them again, two alive and wide awake as I opened the box. These were at once placed on grass, and in five minutes thereafter were feeding. On 15th April, one passed its fourth moult, the other on 17th. On 30th April, I noticed that one was bringing together leaves of the grass and forming a sort of loose cylinder. It was in the middle of a pretty dense tuft, the leaves of which were three to four inches long. On one of these the larva rested, holding by its prolegs, and was spinning a few threads and drawing the leaves down and about it. Before night the inclosure was complete. Nearly a score of leaves were held, mainly by threads at top and bottom, that is, above and below the larva, making a pretty close covering, but open by spaces so that most of the side, and the head, were exposed to view. The larva rested head up, back arched. Mr. Scudder, in But. N. E., has well characterized this structure as "an imperfect cocoon." Pupation took place on the night of 1st–2d May. Some hours after, when the chrysalis had hardened, I cut away the leaves one by one. There were fifteen of them, and the pupa rested upright, its lower end one and a-half

inch above ground, in an angle formed by three leaves. As I cut one of these, it turned over and fell, showing itself to be unattached. In fact the cremaster was found to be furnished with but straight bristles, very short, and there were no hooks by which attachment could be had. As before stated, a male of the typical form came from this chrysalis on 12th May.

I had received young larvæ of this species from Mr. Bean, at Laggan, 25th July, 1886, they having hatched *en route*. I lost all but one of these. It passed first moult 2d August, the second moult 10th August, and soon after became lethargic. I kept it at Coalburgh, and brought it into the house middle of January, 1887, apparently healthy. But a month later it unaccountably disappeared.

Mr. Bruce had also sent eggs from Colorado which reached me 28th July, 1886. From these, five larvæ reached second moult, and went into hibernation, and died during the winter. From the behavior of the different lots of larvæ, it apears that hibernation may take place at either second or third moult.

This, therefore, is the complete history of an Erebia from egg to imago, and, so far as I know, the first such that has ever been published of one of the genus. To get drawings of the several stages, it was necessary to send them to Mrs. Peart, at Philadelphia, through the mails, some five hundred miles, with risk of loss or damage. Indeed, the second larva was in Philadelphia in its last stage, and being returned to me, imperfectly pupated on the way, and died.

The genus Erebia comprises many species, nearly all of which are European and Asiatic. Dr. Staudinger, in 1871, enumerated forty-eight, many of them boreal, others alpine, the latter found as far to the south as the Pyrenees, Alps, Caucasus, and Himalayas. Great Britain is credited with three species, and, in Buckler's Larvæ of British Butterflies, Vol, I, on. Plate VI, are figured the mature larva and pupa of one of these, E. *Blandina*, and the young larva of another, E. *Cassiope*. In the text, Mr. Buckler relates that he raised the larva of *Blandina* from the egg, obtaining pupa and imago; and a brief description of the several stages is given, that of the larval being imperfect, as nothing is said of the several moults. Nor is it told how the larva pupated. Nevertheless, the plate represents the pupa resting nearly upright on a tuft of grass, but not at all inclosed. It looks very much like the pupa of *Epipsodea*. So an incomplete des-

cription is given of the stages of *Cassiope*, but how pupation took place is not told, nor is there a figure shown. The young larva as figured has forked tails, and therefore, I apprehend, it must have been drawn after the first moult.

In North America, are eight or nine species, three at least of which are said to be old world, namely, *Tyndarus*, *Discoidalis*, and *Disa*. One species heretofore erroneously credited to North America, on the authority of Doubleday, E. *Vesagus*, belongs to the Andes, in South America.

The group is a very interesting one, and together with Chionobas, and some others, embraces those members of the Rhopalocera, or Diurnals, which are nearest the Heterocera, or Moths, allied to them in important characters in each of the four stages. The resemblances of the larvæ and pupæ are particularly striking. The latter are destitute of cremastral hooks in Erebia, in Chionobas, even of bristles, and pupation takes place, sometimes on the bare ground, sometimes in or on the sod, in one case, as we have seen, in an imperfect cocoon; sometimes in a real cocoon beneath the surface of the ground; or the larva goes into the ground and pupates naked, in a cavity made by the movements of its body, after the manner of nearly all the Sphingidæ.*

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 36, Volume xxii.)

A. placentia A. & S.

1797—A. & S.,* Ins. Ga., II., 129 pl., 65, *Phalaena.*
1816—Hübner, Verzeichniss, 180, *Heraclia.*
1856—Wlk., C. B. Mus., Lep. Het., III., 610, *Arctia.*
1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 529, *Arctia.*
1862—Clem., App. to Morris, Syn. 337, *Arctia.*
1863—Saund., Syn. Can. Arct. 5, *Arctia.*

*NOTE.—Since the foregoing paper was printed, I have seen the CAN. ENT. for December, 1889, and learn therefrom (Vol. XXI., p. 238,) that Dr. H. Skinner has received examples of *Epipsodea*, caught in Assiniboia, about 325 miles west of Winnipeg, and with them one of the var. *Brucei*, mentioned as var. *Sine-ocellata.*

1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
1883—Hulst, Bull. Bkln. Ent. Soc., VI., 70, = *nais.*
1883—Neum., Papilio, III., 150, *an sp. dist.*
Habitat—Georgia, Canada.

A. quadrinotata Strk.

1878—Strk., Proc. Dav. Ac. N. Sci., II., 271, pl. IX., f. 6.
Habitat—Texas.

A. quenselii Geyer.

1830—Geyer, Zutr. No. 424, ff. 847–848, *Arctia.*
1849—Moeschl., Stett. Ent. Zeit. IX., 173, 174, *Euprepia.*
1856—Wlk., C. B. Mus., Lep. Het., III., 611, *Arctia.*
1858—Wlk., C. B. Mus., Lep. Het., VII., 1780, *Arctia.*
1860—Clem., Proc. Ac. N. Sci. Phil., XII., 527, *Arctia.*
1862—Morris, Synopsis, 223, *Arctia.*
1864—Gn., Ann. Soc. Ent. Fr. 1864, 4e trim., *Nemeophila.*
1866—Pack., Proc. Bost. Soc. N. H., XI., 34, *Arctia.*
1873—Stretch, Zyg. and Bomb, 74 et 222, pl. IX., f. 8 (♀).
1874—Pack., *Rept. Geol. Surv., 1874, 558, f. 14 (larva).
1887—Smith, Ent. Amer., III., 109, *Arctia.*

gelida Moeschl.

1849—Moeschl, Stett. Ent. Zeit., IX., 174, *Euprepia.*
1856—Wlk., C. B. Mus., Lep. Het., III., 611, *Arctia.*
1860—Clem., Proc., Ac. N. Sci. Phil., XII., 528, *Arctia.*
1862—Clem., App. to Morris Syn., 341, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, *Arctia.*
1873—Streck., Lep. Rhop. et Het., 23, pr. syn.
1883—Moeschl., Stett. Ent. Zeit., XLIV., 116, pr. syn.
1883—Neum., Papilio III, 150, pr. syn.
Habitat—Labrador, White Mts., Col.

A. rectilinea French.

1879—French, Can. Ent., XI., 45, *Arctia.*
1887—Smith, Ent. Amer., III., 110, *Arctia.*
Habitat—Illinois, New York.

A. remissa Edw.

1888—Edw., Ent. Amer., III., 184, *Arctia.*
Habitat—H. B. Terr.

A. rhoda Butl.

1881—Butler, Ent. Mo. Mag., XVIII., 135, *Arctia.*

Habitat—United States.

This species bears the same relation to *ochreata* Butl. that *decorata* Saund. does to *nais* Dru., and Mr. Butler suggests that it may be the female of either *phalerata* Harr., or *ochreata* Butl.

A. saundersii Grt.

1864—Grt., Proc. Ent. Soc., Phil., III.. 75 et 324, pl. 4, f. 3, ♂, *Arctia.*

1868—Saund., Can. Ent., I , 27, *Arctia.*

1873—Stretch, Zyg. and Bomb., 74, *Arctia.*

1881—Butler, Papilio, I., 131, *Arctia.*

1883—Hulst, Bull. Bkln. Ent. Soc., VI., 71, *parthenice.*

1883—Neum., Papilio, III, 149, an sp. dist. *parthenice.*

1887—Grt., Ent. Amer., III, 147, *Arctia.*

1887—Grt., Can. Ent., XIX., 32, an sp. dist. *parthenice.*

virguncula ‡ Saund.

1863—Saund., Syn. Can. Arct., 9, *Arctia.*

1864—Grt., Proc. Ent. Soc., Phil., III., 75, pr. syn. *intermedia* Stretch.

1873—Stretch, Zyg. and Bomb., 216, pl. IX., f. 3, *Arctia.*

r875—Grt., Can. Ent., VII., 197, pr. syn.

1883—Neum., Papilio, III., 150, an sp. dist.

1887—Smith, Ent. Amer., III., 110, an sp. dist.

Habitat—Can , N. Y., Mass., N. J., Ills.

Mr. Stretch's species *intermedia* is certainly not referable to *saundersii*, but to *stretchii* Grt. and *oithona* Strk.

A. simplicior Butler.

1881—Butl., Ann. and Mag., N. H., ser. 5, VIII., 311, *Arctia.*

"Possibly a well marked variety of *A. achaia*; but apparently intermediate between that species and *A. saundersii.*" So says Mr. Butler.

Habitat—Oregon.

A. snowi Grt.

1875—Grt., Can. Ent., VII., 197, *Arctia.*

1883—Hulst., Bull. Bkln. Ent. Soc., VI., 70, =*nais.*

Habitat—Kansas.

A. shastaensis Behrens.

1889—French, Can. Ent., XXI., 35, *Arctia.*

1889—French, Can. Ent., XXI., 162, fig. ♀, *Arctia.*

Habitat—Mt. Shasta District, Cal.

A. speciosa Moeschl.

1865—Moeschl., Wien. Ent. Monatschr, VIII., 195, pl. V., ff. 13–14 *Arctia.*

1866—Pack., Proc. Bost. Soc. N. H., XI., 34, =*quenselii.*

1873—Strk., Lep. Rhop. et Het., I., 23, *Arctia.*

1874—Pack., Rept. Geol. Surv., 1874, 558, *quenselii* var.

1883—Neum., Papilio, III., 150, =*quenselii.*

Habitat—Okak, Labr., White Mts.

(To be continued.)

NOTES ON THE INSECT FAUNA OF HIGH ALTITUDES IN CUSTER COUNTY, COLORADO.

BY T. D. A. COCKERELL, WEST CLIFF, CUSTER CO., COL.

(Continued from page 39, Volume xxii.)

(2) Near Micawber Mine, Aug. 6—

Lysiphlebus salicaphidis Ashm.
Lipolexis chenopodiaphis Ashm.
Limneria montana Cr.
Periclistus sp.
Apanteles sp.
Diaeretus atricornis Ashm.
Megachile sp.
Andrena sp.
Halictus sp.
Sapyga aculeata Cr.
Camponotus vicinus Mayr.
" sp.
Perilampus platygaster Say.
Habrocytus rosæ Ashm.
Passalœcus mandibularis Cr.
Lysitermus coloradensis Ashm.
Aspilota obscuripes Ashm.

Aphidius montanus Ashm.
" *atropetiolatus* Ashm.
Sphecodes dichroa Smith.
Prosapis affinis Smith.
Formica integra Nyl.
Dolichopselphus n. g., n. sp., Ashm.

(3) Near Micawber Mine—
Pteromalus vanessæ Harris. Bred from a pupa of *Vanessa*. The larva of *P. vanessa* is about 2½ mill. long, and is tinged with purplish. The pupa is pale yellow, with the eyes red and very conspicuous.

(4) Timber line and above, above Smith's Park Gulch, Aug. 5—
Bombus ternarius Say.
Habrocytus rosæ Ashm.
Nomia nortoni Cr.
Atractodes sp.

Mr. Ashmead remarks, concerning *H. rosæ*: "I first received this species from Messrs. James Fletcher and Harrington, who reared it from a rose-gall collected in British Columbia." I have reared it from galls of *Rhodites ignota* O. S., and *R. fusiformans* Ckll., n. sp., collected at West Cliff.

(5) Near Micawber Mine, Aug. 4—
Tapinoma sessile Say.
Lipolexis atriventris Ashm.
Habrocytus rosæ Ashm.
Leptacis tetraplasta Ashm.
Psilophrys occidentalis Ashm.

(6) Smith's Park Gulch, Aug. 5—
Calliopsis sp.
Tenthredo occidentalis Cr.
" *ferrugineipes* Cr.
Cremastus sp.
Tapinoma sessile Say.
Bracon sulcifrons Ashm.
Aphidius atropetiolatus Ashm

(7) Micawber Mine, Aug. 7—
Lampronota coloradensis Cr.

Camponotus sp.
Formica sp.
Cremastus sp.
Passalœcus mandibularis Cr.
Figites coloradensis Ashm. ♀.
Apanteles sp.
Aspilota pallidipes Ashm.
Pimpla annulipes Brullé.

(8) Horeshoe Bend, 1887—
Urocerus flavicornis Fl.

Dolichoselphus Ashm., is allied to *Atractodes*, with abnormally lengthened maxillary and labial palpi.

LEPIDOPTERA.

Mr. W. H. Edwards has kindly examined many of the butterflies. The two species of *Cidaria* were identified by the Rev. G. D. Hulst.

(1) Lakes of the Clouds, 1887—
Colias meadii Edw.

(2) Near Micawber Mine, 1888—
Nathalis iole Bdv.

(3) Near Brush Creek, June 27, 1889—
Phyciodes camillus Edw.
Nisoniades icelus Lintn.?
Argynnis hesperis Edw.
Lycœna sœpiolus Bdv., ♂, ♀.
" *oro* Scudd.

(4) Near Micawber Mine, June 27—
Pyrameis cardui L.
" " form *minor* Ckll., nov.
Anthocharis ausonides Bdv.
Vanessa milbertii var. *subpallida* Ckll.
Pieris oleracea Bdv.
Gnophaela vermiculata Grote.
Agrotis auxiliaris Grote.
Papilio rutulus Bdv.
Colias scudderii Reak.
Lycœna acmon D. and H.

P. cardui f. minor differs from the type only in being much smaller.

A *P. rutulus* was caught at the flowers of *Erysimum asperum* var. *alpestre* v. nov.

(5) Timber line above Smith's Park Gulch, June 27—
Limenitis weidemeyerii Edw.
Chionobas chryxus West. and Hew.
Colias eurytheme Bdv.

C. chryxus was abundant, but difficult to capture because it flew over exceedingly precipitous and rocky ground.

(6) Horseshoe Bend Gulch, June 27—
Argynnis Edwardsii Reak.
Grapta sp.
Vanessa antiopa L.

(7) Timber line above Smith's Park Gulch, Aug.—
Brenthis sp.
Parnassius smintheus Dbl. and Hew.

(8) Smith's Park Gulch, August—
Brenthis sp.
Colias alexandra Edw. ♂.
Chrysophanus helloides Bdv.
Gnophaela vermiculata Grote ♂, ♀.
Limenitis weidemeyerii Edw.

(9) Near Micawber Mine, Aug.—
Gnophaela vermiculata Grote.
Cidara montanata Moesch. (Aug. 15).
" *nubilata* Pack. (Aug. 4).
Pyrameis cardui L.
Vanessa antiopa L.
Parnassius smintheus D. and H.
Limenitis weidemeyerii Edw.
Alucita hexadactyla L.
Grapta sp.
Pieris protodice B. and L., ♂ (Aug. 6).
Chrysophanus helloides Bdv. (abundant).
Nomophila sp.
Botys sp.
Metrocampa margaritata var. *perlata* Guèn. (Aug. 6).
Plusia sp.
Clisiocampa sp.

Colias alexandra Edw., ♂, ♀
Pieris occidentalis Reak. (Aug. 6).
Satyrus charon Edw.
Colias eurytheme var. *pallida* Ckll.
" " var. *keewaydin* Edw. (Aug. 6).
" " var. *eriphyle* Edw. (Aug. 6).

(10) Horshoe Bend Gulch, Aug. 15—
Colias eurytheme Bdv.

ORTHOPTERA.

Ceuthophilus sp., near Micawber Mine.

HEMIPTERA.

The Hemiptera have been identified by Mr. Ashmead.

(1) Smith's Park Gulch, 1889—
Cicada sp.

(2) Timber line above Smith's Park Gulch, Aug. 5—
Nysius californicus Stal.

(3) Smith's Park Gulch, Aug. 5—
Lygus diffusus Uhler.
" *pratensis* L , var.

(4) Near Micawber Mine, Aug. 6—
Podisus bracteatus Fitch.
Nysius angustatus Uhler.
Anthocoris melanocerus Reuter.
Corizus hyalinus Say.
Hadronema militaris Uhler.
" *robusta* Uhler.

(5) Timber line above Smith's Park Gulch, July 27—
Lioderma viridicata Uhler?

(6) Micawber Mine, Aug. 7—
Lygus pratensis L., var.
Idiocerus alternatus Fitch.
Pycnoderes insignis Reuter.

(7) Near Micawber Mine, Aug. 15—
Alydus eurinus Say.

(8) Near Brush Creek, June 27—
Dacota hesperia Uhler.
Lygus pratensis L., var.

DIPTERA.

Tipula sp., Micawber Mine, Aug. 7.

Musca domestica L., near Micawber Mine, Aug. 6.

Culex sp., Lakes of the Clouds, 1887.

Various other species of Diptera, etc., as well as some *Trichoptera*, and species of *Thrips* and *Tomocerus* (probably *plumbeus* L.), and many Aphides, are as yet undetermined. The Arachnida are represented by *Epeira* and *Misumena* (probably *vatia*), and *Phalangodes robusta* Pack. was found near the Micawber Mine, this being the highest altitude known for this species. The Myriapoda are represented by species of *Lithobius Geophilus* and *Julus*, and most interesting of all, *Polydesmus* was found near the Micawber Mine.

Bibliography.—The only species hitherto recorded from 10,000 feet, or above, on the Sangre de Cristo Range, seem to be *Parnassius*, *Gnophaela*, *Brenthis* and *Bombus*. But some not very distinct ranges have been explored. Many species are recorded from Veta Pass, and Mr. Scudder has written (Appalachia, 1878) on the insects of Sierra Blanca, and Mr. W. S. Foster has collected Lepidoptera on Marshall Pass.

CORRESPONDENCE.

RARE CAPTURES.

Dear Sir:—When in London last winter, I assisted in naming the private collection of Mr. Rowland Hill, our present young curator. As I was going over his material, my attention was arrested by the unfamiliar look of a few specimens he had secured the season before; they had a resemblance to a familiar enough form—Lachnosterna—but much smaller, and I concluded that I had seen it before. After several ineffectual efforts to secure its name, I sent a specimen to Dr. Hamilton, Allegheny, and he has identified it as *Cyclocephala immaculata* Burm., and remarks that "this species is widely distributed from Ohio to West Mexico, but I never heard of its being taken in the Northern States, east of Northwestern Ohio." I have also been in communication with Prof. Fernald, and I copy the following from his reply:—"No. 2 is *Pædisca nisella* Cl., a European species never before reported in the United States."

J. Alston Moffat, Hamilton, Ont.

Mailed March 1st.

The Canadian Entomologist.

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ON CERTAIN STATEMENTS IN SCUDDER'S "BUTTERFLIES OF NEW ENGLAND."

BY W. H. EDWARDS, COALBURGH, WEST VA.

As Mr. Scudder has charged me with blunders of one sort or other, I am compelled to notice the matter, as silence on my part would properly be construed as an acknowledgement that he was right.

I. On p. 1805, the synonymy of Argynnis (Brenthis) *Freija* is given, closing thus: "Argynnis *Chariclea* Edw., in his catalogues." And on p. 1808, under *Chariclea*: "Argynnis *Freya* Edw., in his cat."

In the text, p. 1807, we read that "*Freija* is a circumpolar species in the strictest sense, being found on the northern shores of both worlds, and in each extending southward to the habitable zone. * * * In the New World it occurs from Alaska to Labrador, * * * and in the Rocky Mountain region as far south as Lake La Hache and Crow's Nest Pass, west of Fort McLeod. It is said by Edwards to occur in Colorado, but the specimens obtained there by Mr. Mead, to which he probably refers, belong to the next species" (*i. e.* to *Chariclea*), "while three from Nepigon, referred by him to *Chariclea*, belong here" (*i. e.* to *Freya*).

On page 1809, under *Chariclea*, we read: "This northern butterfly inhabits circumpolar lands on either side of the Atlantic, but extends much further southward on the western than on the eastern continent, being found * * * not only in Greenland and Labrador, but * * * even (in) Colorado," etc.

Now, although I knew I had not mistaken one of these species for the other, as alleged, I got from Mr. Bruce a pair of the Colorado form, taken by him last summer, and mailed them to Mr. Butler, British Museum, asking which species they were. The reply came two weeks ago, short, sharp and decisive: "Your species is *Freya*; it can by no means be confounded with *Chariclea* * * * It has nothing to do with *Chariclea*."

The Colorado species is *Freya*. The examples taken by Mr. Mead in Colorado, 1871, and of which Mr. Scudder speaks, all passed through my hands, as did the whole catch. I received the butterflies, week by week, through the mails in papers; and, on Mr. Mead's return, we divided the entire lot equally between us. There were many *Freya* (and some of them I have now), but no *Chariclea;* nor has *Chariclea* ever been taken within the limits of the United States, so far as I know. It flies as far to the south as the Canadian Pacific Railway in the Rockies; and I not only have examples taken at Laggan by Mr. Bean, but I have twice had eggs and larvæ from him.*

II. On p. 1863, in the synonymy of Pamphila (Limochoıes) *Palatka* it is said that Pamphila *Dion* Edw., CAN. ENT., XI., 238, is the same thing.

*Mr. Scudder says, page 1807, under *Freya*, by which he means *Chariclea*: "To judge from the captures north of Lake Superior, it is a late species, flying late in August and early in September, or at the very close of the season, at that place. Evidently winter must be passed, by the caterpillar just from the egg." I have not learned from Mr. Bean the date of first appearance of *Chariclea* imago, but I received eggs sent by him 4th of August, 1866, and another lot 6th August, same year. Part of each lot hibernated direct from the egg, but part went past third moult and then hibernated. I lost these during the winter. But these last larvæ, had they lived, would have reached imago three or four weeks earlier than the larvæ that hibernated from the egg. This would give the appearance of two broods of the butterfly, and account for some flying in July and others in September.

Under *Chariclea*, p. 1809, by which Mr. Scudder means *Freya*, we read: "Nothing is known of its seasons or history, except that it appears in Colorado early in the season, in May, or early in June, so that winter can certainly not be passed as a caterpillar just from the egg." I have not had eggs of *Freya* from Colorado, but received some from Laggan, sent 6th June, 1886; and again, sent 4th June, 1889. I lost the survivors of the first lot after they had passed the second moult; but those of the last lot (6) reached eight-tenths of an inch in length, and had passed three moults before 2nd July. I thought from their actions they would pupate, but after several alternations of quiet and activity, they finally dropped asleep, and I sent them to Clifton Springs, N. Y., 16th of July, to go in the refrigerating house.

The species *A. Helena* is the representative of *Chariclea* in Colorado, and as that behaves so *Chariclea* might be supposed to behave, if it dwelt in Colorado. Eggs of *Helena*, sent from that State 24th July, 1886, gave larvæ, all of which passed the third moult and then went into hibernation. I lost them during the winter.

I may as well here speak of one other of this group, *A. Triclaris*, found in Colorado and north. I received eggs sent from Laggan, 2nd August, 1889. The larvæ passed second moult and hibernated, and were sent to Clifton Springs 19th September.

The larvæ of all four species are closely like that of *Bellona*. In the first stage, the alternate segments are green and brown, as in *Bellona*, and also *Myrina*. The spines of *Triclaris* are somewhat different from the rest after the first stage, but these others are same as in *Bellona*, so far as I carried the larvæ. Mr. Scudder has tried hard to find characters in the preparatory stages by which to separate the genus Brenthis Scudder (not the coitus Brenthis of Hubner, by a good deal), but wholly without success; and the same is true of the imago. The small species are merely a group of the genus Argynnis. As to two other genera, so called, chipped off from Argynnis, viz., Semnopsyche and Speyeria, there is not a feature in any stage to justify either of them.

Had Mr. Scudder read the two descriptions ever so carelessly he ought not to have made a mistake like this. Also Prof. French pointed out to him the error, and I did the same indirectly through Mr. French. But, nevertheless, he was bound to have his own way. The species *Palatka* was named from a single ♂, 1867, taken at St. Augustine, Fla. In several years this example was an unique. I have it before me now as I write. But in later years *Palatka* has been taken abundantly at Indian River, mostly by Dr. Wittfeld, and is known to all collectors. In the description the expanse is given at 1.7 inch. Omitting all mention of upper side, we come to under side of secondaries, which differs widely from *Dion* in colour and absence of markings, "Under side of secondaries uniform brown, immaculate." *P. Dion* was described in 1879, from the southern shore of Lake Michigan, from Hamilton, Ont., and from Nebraska. It is compared with *Arpa* B. & L. Expands 1.2 inch (that is to *Palatka* as 12 is to 17). "Under side of secondaries ferruginous, of uniform tint, *except that there are two pale rays from base*, one of which passes through cell, the other occupies submedian interspace to margin." These pale rays are a conspicuous feature of this species. *Palatka* is a coffee-brown, solid colour. *Dion* is a red-brown, with two pale bands. On p. 1931, among "Additions and Corrections," are these words: "1715, line 9, the species here referred to as *L. Palatka* is not the *Palatka* of Edwards, but his *Pallas*." I never described a species under the name of *Pallas*. The author has got things in a tangle.

III. On p. 1595, in the excursus "Butterflies as Botanists," we read: "The narrow choice of certain species is, perhaps, indicated in our own fauna of the food plant of Phyciodes *Tharos*. So far as we know it feeds only upon a single species of Aster; 'and if your butterfly selects only that,' said the late Dr. Gray, when I told him of this, 'it is a better botanist than most of us.' Only one other plant has been alleged as its food, and that probably by mistake. This special aster the female selected out of many furnished it by Mr. Mead whereon to lay her eggs, and no one has yet reared it upon anything but aster Novæ Angliæ. * * * Such restriction of choice, if really true, certainly indicates some keen perception on the part of the butterfly." It certainly would.

Mr. Mead, CAN. ENT., VII., 161, 1875, says: "I prepared a box by partly filling it with earth, and transplanting into this small specimens *of all the common Compositæ I could lay my hands upon*, * * * and

about a dozen ♀ ♀, *P. Marcia* and *Tharos*, were introduced. In a few days I examined the leaves and found six patches of eggs upon one of the plants, etc. The plant proved to be a species of aster, * * * from the leaves I think it will prove to be aster Novæ-Angliæ. No eggs were found on any of the other plants." He also says that he afterwards found a brood of young caterpillars upon a plant of this aster in a meadow.

In Can. Ent. IX. 1, 1877, I related that I was in the Catskills with Mr. Mead when he made the above mentioned discovery, and that I afterwards got eggs for myself by tying the female butterfly over the stems of A. Novæ-Angliæ, and brought the larvæ while young to Coalburgh. "On the journey, stopping at several points, I had to give them leaves of such species of aster as I could find, and they ate any and all readily—even German Asters from the garden." Then I related how I repeatedly got eggs of *Tharos* in same way at Coalburgh, W. Va., (where A. N.-Angliæ does not grow). I do not know that *Tharos* will feed on any other plants than asters, but they will eat any sort of aster surely.

IV. On p. 1926: "Mr. Edwards tells me that Mrs. Peart observed one case (of *G. Interrogationis)* in which the final egg of a chain had eleven ribs, when all the others had nine. Could a second female have *possibly* placed an egg upon a chain laid by another!?" I did not know what the author meant to imply by the italicised word and the note of surprise. The observation as to this chain of eggs is mentioned in Part VIII., Vol. 3, Butt. N. A., in the paper on *Interrogationis*, as follows: "I had supposed the number of ribs in all eggs laid by one female was the same, but Mrs. Peart found that, in a string I sent her, the topmost egg had eleven ribs, while all the rest had but nine, as shown on the plate, fig. a^4." The eggs were laid by a single female in confinement, and were put in alcohol and so sent Mrs. Peart. It occurred to me to ask Dr. C. S. Minot, an authority in biology, if he could explain how this could have been, and he replied: "The eggs of insects descend from the ovarian tubes into the so-called uterus, where they lie for some time, and have the shell formed by the secretions of the uterine walls. These walls are thrown into folds, which are characteristic of the genera and species, and the egg shell, so far as its outer pattern is concerned, is a cast, so to speak, of the folds in question. It seems to be quite possible that the number of folds (and therefore the number of ribs on the shell) should vary in different

parts of the uterus. But I doubt if there are any observations on that point at present." That seems a reasonable explanation.

V. *Argynnis Atlantis*, p. 578. It is said: "The early history of this species is almost wholly unknown, the different stages of the caterpillar and the chrysalis never having been adequately described." I had this species from the egg, and described every stage, egg, larva and chrysalis, in CAN. ENT., XX., p. 1., 1888, in the manner usual with me; and as Mr. Scudder has copied my descriptions of other species by wholesale, I am at a loss to see what there is "inadequate" in this of *Atlantis*, or why it is dismissed so curtly.

VI. *Colias Eurytheme*, p. 1126. Under the division of *Eurytheme-Eriphyle* comes the species *Harfordii* H. Edw., and its var. or co-form *Barbara*, and reference is made to the description and life history of same, with plate, in Butt. N. A., V., 3. I showed in the paper cited that the male *Harfordii* comes near *C. Interior* Scudder, a species which the discoverer regards as genuine; and that the var. (or co-form) *Barbara* approaches the *Eurytheme* group, *i. e. Eurytheme* and *Philodice*, and I said, "So that the species in certain points resembles species belonging to two distinct sub-groups." Dr. Hagen, Trans. Bost. Soc. N. H., 22, 165, 1883, judged *Harfordii* to be neither more nor less than *Interior*. Mr. Scudder might have compared the genitalia, as he believes in those organs as tests of species, and told us wherein *Harfordii* resembles *Eurytheme*.

VII. *Limenitis Disippus*, called Basilarchia *Archippus*. There is so much in this life history that is at variance with what I myself have observed in West Virginia, that one would seem to be dealing with a distinct species, and that the New England form could not be the same as the Virginian.

Page 261. The protection of the egg from "ants, mites and spiders * * * is undoubtedly in the fewness of their number on one plant. The spider that finds two eggs of a Basilarchia in one day must be an excellent hunter." In this region there is no limit to the number of eggs that may be laid on one tree. The seedling plants of aspen are often full of eggs or larvæ. On one occasion I found four larvæ on four leaves of one little stem; on another I found eleven eggs and young larvæ on a plant not over eighteen inches high, nearly one to every leaf; on another I found nine eggs on a small tree. I once discovered a female oviposit-

ing on a willow of some ten feet high. She laid in my sight at least six on different parts of the tree, and I brought away two of them, the rest I was unable to reach.

I asked Prof. Rowley, at Curryville, Mo., what was his experience in this matter, he says: "I watched a female *Disippus* last August laying eggs on aspen. She flitted here and there, and in the course of about fifteen minutes had laid a dozen eggs, and was busy when I inadvertently frightened her away. Once or twice she returned to the same twig. In searching for cases of this species on New Year's day (1889), I examined but two plants of willow; the first, scarcely four feet high, yielded twelve cases; the other, less than ten feet high, gave me forty-five. In one case, two were found on one twig, not twelve inches apart, on another three. I have seen five larvæ on one small sprout of aspen; seven eggs on another. Once found two young larvæ on one leaf, both on perches, one at the end, the other at the side."

Page 273. "On hatching * * * it eats the apical leaves, and then those next in order, omitting none in its passage down the stem, so that, as Lintner says, its position may be 'at once revealed by the twig upon which it had fed * * * being entirely defoliated from its tip about eighteen inches downward, leaving only the footstalks remaining.'" The fact is that the larva makes its case of the leaf it was hatched on, though, for cause, it will move to another in order to make the case. As to stripping a stem, even the mature larva does not do that to any such extent as is intimated above that the young larva does. It is at all stages a light feeder.

Page 277. "It is a curious thing that we find in the caterpillars of the first brood, no tendency whatever to construct hibernacula; here we have an instinct inherited by alternate generations." On page 1416, speaking of the same caterpillar: (it is) "the caterpillar of the latest brood which constructs a hibernaculum * * *; yet, with this common butterfly, no instance has been given where a caterpillar of an earlier brood showed the remotest tendency towards such action." Now, Mr. Scudder may be right for New England, where *Disippus* is said to be two-brooded only, but in West Virginia the caterpillars of the brood before the last (there being three annual broods) often make hibernacula, and some of the same lot will do this, while others go on to pupa and imago. If this fact has never been recorded before, I put it on record now. Some

of a lot of larvæ also will make their cases after second moult, others after third and in the following spring. Some, but not all, of those which hibernated after second moult, will pass three more moults. There would seem no reason why some larvæ of the first of the three Virginia broods should not make cases, as some of the second (in mid-summer) do. And certainly we could not say positively that they do not; nor do I see how one could say positively that some of the first New England brood do not make cases. The evidence against it is negative only. I have found that caterpiliars and butterflies are apt to do just what we would think they could not. I never knew of a larva hibernating after first moult, as it is stated that they "not at all infrequently" do, on page 275; nor do I think the small larvæ, after that moult, would have the physical ability to cut out and weave together a case.

A RAINY DAY ON THE MOUNTAINS.

BY DAVID BRUCE, BROCKPORT, N. Y.

There is a tradition extant in Denver that the sun shines in Colorado nearly every day. This last summer was a woeful exception, however, for, from the middle of April until the end of June, the weather would have been thought respectable only in Labrador, but the unusual wet and cold spring, although it retarded the insects, gave such an impetus to the growth of flowers and herbage on the mountain sides and tops, that, when the hot weather set in, all species of diurnals appeared to be unusually abundant, and every kind seemed to be flying at one time. I had collected for some time with indifferent success during this wet season in the foothills and lower canons, and I made up my mind, despite the weather, to try the higher ranges. So I climbed above timber line one showery afternoon the beginning of June, and spent the night in the same shanty I had occupied on my visit in 1887; the proprietors, two honest miners, welcomed me heartily. The next morning was gloomy, cold mists rolled up from the valley and white clouds collected round the peaks, but I donned a pair of miner's overalls and went out determined to do something. In a drizzle that seemed as much snow as rain, I climbed the sloping sides of Mount Bullion, which was covered more thickly with

vegetation than I had ever seen it before, owing to the frequent rain. I had not searched long before I found several full grown larvæ of *Parnassiuss Smintheus* on Sedum. This was a fair beginning, as I had for several years searched unsuccessfully for this larva. A pretty Arctian larva was also feeding on the same plant (from this I bred *Arctia cervinoides* Strecker). I commenced overturning the smaller rocks, and was soon rewarded by finding numerous larvæ and pupæ, also many small Noctuids. Attached to the sides of larger rocks I found several pupæ of butterflies ; these produced in a few days *Melitæa anicia* and *Argynnis Helena*. Under flat stones and in crevices were many species of *Agrotis*, sometimes from ten to thirty individuals crowded together. The ants were swarming under most of the rocks, and they, with the predaceous beetles had destroyed hundreds, as was evidenced by the mutilated wings and empty pupæ. I was so fascinated with my occupation that I forgot all about the weather. After I had filled all my tins and boxes and got very hungry, I worked my way to the cabin again, quiet satisfied and surprised with the morning's work. From the larvæ and pupæ obtained I bred :—

Arctia cervinoides Strecker, five specimens.

Arctia Brucei H. Edw., three specimens.

Arctia sp. (?), one specimen.

A grey *Bombyx*, allied to *Dasychira*, from a tufted pupa enclosed in a cocoon like *Halesidota* but thinner, this came out next day in the box, and I didn't see it until it was spoilt and could not recognize it.

Apatela, two, allied to *Felina*, but larger and darker.

Plusia Hochenworthi, several.

Agrotiphila Montana, six, the pupa and imago were common under rocks.

Agrotis ochrogaster, four, imagines abundant and variable.

Agrotis, several specimens not yet determined.

Hadena lateritia, one.

Anarta melanopa, common, both pupæ and moths.

On sheltered sides of rocks were several *Glaucopteryx magnoliata*, or a species very like it, and one *G. phocataria*. Larvæ and pupæ of *Melitæa anicia* were not uncommon. *Argynnis Helena*, one pupa, also one of *Pieris calyce*.

The elevation of my hunting ground was about 13,000 feet.

THE NOCTUIDÆ OF EUROPE AND NORTH AMERICA COMPARED.

(Sixth Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

Tribe *Stiriini.*

This tribe is, so far as I know, exclusively American. The thorax is elevated, the patagia usually deflected. The eyes are naked; the front embossed; the legs thinly scaled, with a claw on front tibiæ; the abdomen somewhat short and weak, untufted on dorsum; the wings pointed at tips. The genera seem to fall in between *Calpe* and *Plusia.** They are: *Basilodes*, *Stiria*, *Stibadium*, *Fala*, *Plagiomimicus*, *Acopa.* The genus *Cirrhophanus* probably belongs to the *Heliothini;* we do not know the larva, but the moth is allied to *Chariclea delphinii*, by the Hübnerian character of the pattern of ornamentation. It is probable, also, that *Chamaecleа* is best placed among the Heliothians.

Polenta, referred here by me (CAN. ENT., XV., 75), based upon an erroneous identification of Mr. Morrison's *Tepperi*, with my *Plag. Richi*, may be related to one of the species figured by Hübner in the "Zutraege," under *Schinia.* I saw the type, but was not able to examine it for generic characters. It seemed to me to be a faded example of a southern form of *Plagiomimicus*, which I possessed, narrower than *Pityochromus*, of a delicate olive green, with a frontal cup-like excavation and a claw on the fore tibiæ. Mr. Smith assures us that *Tepperi* has the fore tibiæ unarmed; consequently, I described my species as *P. Richi.* Finally, Mr. Smith's *Cerathosia* may belong here. This moth has the false appearance of a *Psecadia.* I have shown that it is not a micro, neither is it an Arctian, "next to *Utetheisa*," as stated by Mr. Smith. It has a globose thorax; a frontal horn, thinly scaled legs with a claw on front tibiæ. The shape

*In reference to the question of rank in the Lepidoptera and to a former paper of mine in these pages, I would state that, while from morphological grounds, we must consider the four-footed butterflies as the highest, the sequence *within* the family must be decided on comparative grounds. It may be that the *Satyrinæ* are the lowest subfamily group of the *Nymphalidæ*, but they must be nevertheless classed with the family. The characters by which the butterflies approach the moths are apparent in all the groups, as might be expected if we consider the moths to represent an older phase of the Lepidoptera. The highest *Nymphalidæ* must be sought for in the tropics; but it may be, that the sequence in our North American fauna is to be inaugurated by the Hackberry butterflies.

of the wings is not unlike *Acopa*. The secondaries are 8-veined: vein 5 weaker; costal vein 3-branched; 7 to tip; 7 and 6 a rather short furcation; 8 thrown off from the upper margin of 7 near the base. The frontal horn is impressed on the face. The moth was evidently classed "next to *Utetheisa*," upon Hübnerian characters: the paler, spotted and narrower primaries the bright discolorous hind wings. A superficial resemblance to *Emydia* and *Utetheisa* is thus given. *Utetheisa* has a smooth front and unarmed tibiæ, fringed antennæ, with two stronger bristles on each joint. *Cerathosia* has ocelli, and is otherwise distinct from the Lithosians, while the curious termination of the generic title *(thosia?)* would seem to be a fragment of the Greek *lithos*. The discovery of the larvæ of *Cerathosia* will probably throw additional light upon the affinities of the insect. In the mean time, I wish to point out that, in its generic characters, this form coincides in many particulars with the Noctuidæ belonging to this tribe, as also to the *Tarachini* in its scaly vestiture.

Tribe *Plusiini*.

The thorax is rather short and square, but globose above, with hairy, somewhat silky covering, which forms, posteriorly, an abrupt tuft. The eyes are naked, lashed in *Plusia*, unlashed in *Telesilla*. The wings are somewhat pointed with full external margins. The tibiæ are unarmed. The ornamentation of *Plusia* is remarkable for the silvery or golden middle marks, or sheeny patches. The American species are forty-two in number, exceeding the European thirty-eight; but, probably more remain to be described with us. We have representatives species, i. e. *Putnami*, allied to the European *festucæ*, while *parilis* is found in Lapland and Labrador. The question whether *ni* can be separated from our *brassicæ*, I have been inclined to answer negatively. The peculiar abdominal tufts speak for the identity of the forms. Among American forms are a greater number of gray and brown species, allied to *gutta*, *interrogationis*, *chalcytes*, etc., and are, perhaps on the whole, less showy. Nevertheless, a resemblance may be traced between many species, as between *V-argenteum* and *Mappa*, *Zosimi* and *balluca*, etc. The resemblance is further shown in the species of *Habrostola*, which have the caterpillar 16-footed and the moths without metallic marks, while *Plusia* has 12-footed larvæ. But the most remarkable among the American species of *Plusia* are the three mimetic forms: *thyatiroides* which resembles a

Thyatira, formosa which resembles a *Leptina* and *striatella* which resembles a *Heliophila (Leucania). Behrensia* is a Californian type, allied to *Habrostola;* and *Deva*, an eastern and western genus, as closely allied to *Plusia.*

Tribe *Heliothini.*

The body is untufted, the abdomen rather short, the eyes (except in *Anarta)* naked, sometimes narrowed, the tibiæ usually armed, the antennæ brush-like. The activity of the species, and several of their characters, suggest a resemblance to the *Agrotini;* so that I have thought of them as flower-haunting Agrotidians, whose bright colors are due to their changed habits and the gay tints of their floral homes. How the colors of the larva may come to resemble those of the plant on which it feeds, how the tints of the moth may copy the corolla in which it hides, has been shown by Prof. Kellicott in the case of *Rhodophora florida.* Several of the European genera are represented in North America by identical or related species. In particular is this the case with the species of Hübner's genus *Heliothis.* As might be expected, the flowery western plains afford a large number of species; while, in Europe, there are some forty species belonging to about thirteen genera, in America we have over 110 species belonging to about thirty-five genera. The species of *Heliothis* seem identical with the European; whether they have been imported with plants (which seems less likely), or are unchanged survivals, I cannot decide. No variety of *armiger* like var. *umbrosus*, which is longer, more of a pale olivaceous, and not dirty ochrey like the type, and which I have taken in Southern cotton fields, seems to be known in Europe. My *Pyrrhia angulata* and *P. stilla* are, beyond any question, distinct from the European *P. umbra.* The pink and yellow *Rhodophora* and *Rhodosea* are peculiar to America; the extraordinary genus *Heliochilus* is said to occur likewise in Aisa. The shiny white genera *Euleucyptera* and *Tricopis* are peculiarly American. I regard *Nyctophaeata (Epinyctis)* as a Heliothian, notwithstanding certain coincidences, mostly in outline, with the *Cuculliini*, or again in armature with *Cleophana.* The European genus *Xanthodes* appears to belong here, and we seem to have a representative species in the Texan *X. buxea*, but I have not been able to compare the moths. The white coloured genera *Antaplaga*, *Grotella*, *Triocnemis*, prepare us for the following tribe. Our beautiful western species, *T. saporis*, has a resemblance to the European *Euterpia laudeti.*

Tribe *Tarachini.*

The thorax is squamose, being covered with flattened scales. The legs and wings are also covered with oppressed scales; while the form is, on the whole, like the preceding type. Whether more than the genus *Tarache (Acontia)* and *Chamyris* belong here, I am doubtful—*Trichotarache* having a resemblance to the Heliothians, to which *Xanthodes* and *Trileuca* may also belong. The genus *Tarache* has its metropolis in Africa. We have some twenty-two species, while Europe has but six. The species bear a general resemblance to each other from the prevailing white colour, to which *terminimaculata* offers a singular exception. Our most beautiful species, with a resemblance to the exquisite moth *Ciris Wilsoni*, is, perhaps, *Tarache lactipennis* Harvey.

Tribe *Eustrotiini.*

The moths are small, with broad squarish primaries, which have usually somewhat of a tortriciform cut, rounded secondaries, the squamation on the body thin, mixed scales and hair. The eyes are naked, antennæ simple, the form is frail. Boisduval calls these insects "*Noctuophalenidæ.*" The caterpillars are 12 or 14-footed. The typical genus *Eustrotia (Erastria)* has nine European and thirteen American species. The European genus *Thalpochares*, with twenty-six European species, is but sparingly represented with us. I have been able only to study the neuration of *aetheria*, which is an undoubted *Thalpochares.* In this group I have found the neuration useful in separating the genera. From neurational characters I have separated the American forms, related to the European genus *Agrophila*, under *Spragueia.* I have also referred here, under the generic name *Euherrichia*, certain American forms with silvery marks, previously referred to *Eriopus.* The peculiar Californian genus *Annaphila*, with fourteen species curiously resembling miniature *Brephinæ*, I refer also here. Among interesting American genera are *Exyra*, which is parasitic on *Sarracenia*, the pitcher plants; *Escaria*, a western form, and *Azenia* with large clypeal projection. This tribe, although represented by some of the principal European genera, offers many peculiar American forms, such as *Tripudia*, *Gyros* and *Fruva.* The departure from the European types is perceivable. Consult for the neuration of *Thalpochares* and *Eustrotia* Grote, N. Am. Ent., I., p. 46–47. Also, for the structure of *Erotyla*, *Spragueia*, *Fruva*, *Xanthoptera* and *Exyra*, CAN. ENT., XI., pp. 231–238. For *Euherrichia*, New Check List, 1882, p. 64, (sub. *Herrichia).*

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 55, Volume xxii.)

A. stretchii Grt.

1875—Grt., CAN. ENT., VII., 197, *Arctia.*
1883—Neum., Papilio, III., 150, =*intermedia.*
1886—Grt., CAN. ENT., XVIII., 110, an var *intermedia?*
Habitat—Texas.

There is no doubt but that Mr. Neumoegen's reference of this species to *intermedia* is correct.

A. superba Stretch.

1873—Stretch, Zyg. and Bomb., 227, pl. 9, f. 12, *Arctia.*
1887—Smith, Ent. Amer., III., 111, *Arctia.*
Habitat—Vancouver.

A. virgo Linn.

1758—Linn, Syst. Nat., I., 501 (ed x.), *Bombyx.*
1764—Clck.*, Icones, pl. 45, f. 5, *Phalaena.*
1764—Linn, Mus. L. U., 311, *Bombyx.*
1767—Linn, Syst. Nat. (ed. xii.), 820, *Bombyx.*
1775—Fabr., Syst. Ent., 582, *Bombyx.*
1781—Fabr., Spec. Ins., II., 199, *Bombyx.*
1787—Fabr., Mant. Ins., II., 129, *Bombyx.*
1791—Oliv., Ent. Meth., V., 93, *Bombyx.*
1793—Fabr., Ent. Syst., II., 1, 472, *Bombyx.*
1793—Gmel., ed. Linn. Syst. Nat., 2419, *Bombyx.*
1797—Sm. and Abb., Ins. Ga., II., 123, pl. 62, *Phalaena.*
1816—Hübner, Verzeichniss, 180, *Euplagia.*
1823—Hübner, Samml. Ex. Schmett. II., pl. 402, *Euplagia.*
1837—Harris, Cat. Ins. Mass., 73, *Arctia.*
1841—Harris*, Rept. Ins., Mass, 244, *Arctia.*
1856—Wlk., C. B. Mus., Lep. Het., III., 608, *Arctia.*
1858—Duncan, Nat. Libr., XXXII., 175, pl. 19, f. 3, *Spilosoma.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 528, *Arctia.*
1862—Clem., App. to Morris Syn., 338, *Arctia.*
1862—Harris*, Ins. Inj. to Veg., ed. Flint, 345, *Arctia.*

1863—Saund., Syn. Can. Arct., 6, *Arctia.*
1864—Grt., Proc. Ent. Soc., Phil., III., 325, pl. 4, f. 4, ♂, *Arctia.*
1873—Stretch*, Zyg. and Bomb., 74, 126, pl. 6, ff. 1, 2.
1876—Moeschl., Stett. Ent. Zeit., XXXVII., 296, *Arctia.*
1878—Graef., Bull. Bkln. Ent. Soc., I., 4, var. of.
1878—Schaupp*, Bull. Bkln. Ent. Soc., I., 59.
1881—Graef, Bull. Bkln. Ent. Soc., IV., 58, *Arctia.*
1883—Hulst, Bull. Bkln. Ent. Soc., VI., 70, *Arctia.*
1887—Smith, Ent. Amer., III., 110, *Arctia.*
var. *parthenice* Kirby.
1837—Kirby, Fn. Bor. Amer., IV., 204, *Callimorpha.*
1862—Clem., App. to Morris Syn., 339, *pr. var.*
1863—Saund.*, Proc. Ent. Soc., Phil., II., 28, *Arctia.*
1863—Saund.*, Syn. Can. Arct., 5, *Arctia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 116, *Arctia.*
1864—Grt., Proc. Ent. Soc., Phil., III., 325, =*virgo.*
1879—Beth., CAN. ENT., XI., 153, *Arctia.*
1883—Hulst, Bull. Bkln. Ent. Soc., VI., 71, =*saundersiana.*
1883—Neum., Papilio, III., 149, =aberr. *virgo.*
1887—Grt., CAN. ENT., XIX, 31, =*virgo.*
1887—Smith, Ent. Amer., III., 110, =*saundersii.*
Habitat—Can. to Ga., west to Iowa, Mo., Ills., Mich.
An omnivorous feeder, according to records and statements.

A. virguncula Kirby.
1837—Kirby, Fn. Bor. Am., IV., 304, pl. 4, f. 6, *Callimorpha.*
1856—Wlk., C. B. Mus. Lep. Het., III., 609, *Arctia.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 528, *Arctia.*
1862—Clem., App. to Morris Syn., 338, *Arctia.*
1873—Stretch, Zyg. and Bomb., 74, 218, pl. 9, f. 5, *Arctia.*
1879—Beth., CAN. ENT., XI, 153, *Arctia.*
1881—Coquillet*, Papilio, I., 7, *Arctia.*
1887—Smith, Ent. Amer., III., 109, *Arctia.*
nais ‡ Saund.
1863—Saund., Syn. Can. Arct., 9, *Arctia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 117, pr. syn.
Habitat—Can.. Me., N. Y., N. J., Ills.
Recorded as feeding on *Polygonum aviculare.*

A. williamsii Dodge.

1871—Dodge, CAN. ENT., III., 167, f. 34, *Arctia*.

1873—Stretch, Zyg. and Bomb., 74, *Arctia*.

Habitat—Colorado.

(To be continued.)

CORRECTION OF AN ERROR.

BY W. H. EDWARDS, COALBURGH, WEST VA.

Mr. H. J. Elwes has recently published a paper in Trans. Ent. Soc., London, 1889, p. 535, entitled "A Revision of the Genus Argynnis," and on page 574 writes as follows :—"I have also specimens of *Arge* Strecker, from Strecker and Mr. Holland, both from Spokane Falls and California, which are, undoubtedly, the same as *Erinna*, which was described in 1883 as a var. of *Eurynome* by Edwards, and in his catalogue of 1884 is put down as a variety of *Montivaga*. If, therefore, he is himself so uncertain of the true position of these forms, he cannot expect others to follow him blindly," etc. On reading this I looked at the catalogue referred to, and sure enough, on p. 30, *Erinna* is set down as a var. of *Montivaga*. How this happened I cannot say, but I suppose by an error of the printer, which was overlooked in correcting the proof. I see the same mistake occurred in the list which closed Vol. 2, Butt. N. A., also dated 1884 ; but as the list was copied from the catalogue, that is understood. *Erinna* was rightly described by me in 1883 as a var. of *Eurynome*, which, to my mind, it undoubtedly is. Part of my collection is now in possession of Dr. Holland, including *Eurynome* and its vars., and I wrote him to please look at the *Erinna* specimens and tell me what the labels say. I have his reply as follows :—"All the specimens bearing that name are classified in your collection under *Eurynome*, according to your original description. The labels read :

A. Eurynome.
var. *Erinna* Edw.
Type. Spokane Falls."

I therefore suggest that persons using my catalogue should note the correction, and transfer *Erinna* to *Eurynome* on page 29, following *Arge*. Str.

APPENDIX TO THE NOTES ON INSECT FAUNA OF HIGH ALTITUDES.

BY T. D. A. COCKERELL, WEST CLIFF, CUSTER CO., COLORADO.

Alpine Orthoptera.

Mr. L. Bruner has kindly identified the following Orthoptera, found at 10,000 feet and upwards :—

Circotettix undulatus Thos., near Micawber Mine, Aug. 6.

Ceuthophilus maculatus Scudd., ♂, near Micawber Mine.

Pezotettix dodgei Thos., ♀ and pupa, timber line above Brush Creek, about 12,000 feet, Aug. 5.

Gomphocerus carpenterii Thos., ♀, same locality and date as *P. dodgei*.

Alpine Lepidoptera.

The Rev. G. D. Hulst has kindly identified the following Lepidoptera, from 10,000 feet and upwards in Custer Co., Colo., additional to my previous list :—

Acidalia Californiata Pack., near Micawber Mine, Aug. 6.

Cidaria designata Hübn., Micawber Mine.

Botis plumbosignalis Fernald., near Micawber Mine, Aug. 6.

Euceratia ? georgiella Hulst., near Micawber Mine, Aug. 6.

There are a few misprints in my paper, viz.:—P. 39, line 15 from top, for Welsh read Walsh ; p. 39, line 16 from top, for pickly read prickly ; p. 56, line 9 from top, for *vanessa* read *vanessæ ;* p. 57, line 9 from top, for Horeshoe read Horseshoe ; p. 57, line 10 from top, for Fl. read Fb.; p. 59, line 7 from top, for Horshoe read Horseshoe.

NOTES.

The Tachinid Parasite of Cimbex Americana.—Mr. L. Bruner, in the report of the Entomologist, Nebraska State Board of Agriculture, for 1888, has an interesting article on that notable pest *Cimbex Americana* Leach, in which he states that although the insect is abundant in Nebraska, he has failed to find that it has any parasite. Last year, however, I obtained a larva of *C. Americana* on willow by Short Creek, Custer Co., Colorado, which produced the puparium of a Tachinid parasite. In " Insect Life," 1889, p. 164, we learn that Mr. Lugger has also found a Tachinid parasite of the *Cimbex* in Minnesota, presumably the same species as the Colorado one. It will be curious if it turns out that the parasite is confined to high latitudes and altitudes, while its host is more widely spread. T. D. A. Cockerell, West Cliff, Custer Co., Colorado.

BOOK NOTICES.

THE CAVE FAUNA OF NORTH AMERICA, with remarks on the Anatomy of the Brain and Origin of the Blind Species. By A. S. Packard, M. D. Vol. IV: First Memoir—National Academy of Sciences. 4 to., pp. 156.

The author of this admirable volume is everywhere known throughout the scientific world from his numerous works, especially on Entomology, and has obtained a deservedly high reputation in Europe as well as in America. This reputation will, we are confident, be, if possible, enhanced by the elaborate monograph before us. It contains many original observations of cave animals, some careful scientific investigations, and a very interesting chapter of philosophic considerations. It is also fully illustrated by a map of the Mammoth Cave in Kentucky, a number of wood cuts and a series of twenty-seven beautiful lithographs, nearly all of them drawn by the author himself. The work begins with a description of the Mammoth Cave and others in the neighbourhood, and gives lists of the various animals found within them; an account of the Wyandotte and other caves in Indiana, Clinton's Cave in Utah, and one in Colorado; a discussion of the geological age of the caves and their inhabitants, the mode of colonization and the source of their food-supply. The second chapter describes the vegetable life of the caves, which is naturally of the most meagre description. Then follows a systematic description and list of the invertebrate animals found in North American caves, among which spiders are the most numerous. Insects are represented by eight species of Thysanura, four of Orthoptera, two of Platyptera, ten of Coleoptera and nine of Diptera—a by no means extensive list, but one that includes some very curious and interesting forms. The beetles of the genus *Anophthalmus* are especially remarkable and attractive to the ordinary entomologist. Lists are also given of the European and North American cave animals, and of the blind, eyeless creatures which do not live in caves, and which, strange to say, almost equal in number their cavernous relatives. The next chapter gives a careful account of the anatomy of the brain and eyes (when partly developed) of certain blind Arthropods. The chief interest of the work culminates in the final chapter where the author discusses the origin of the cave species as bearing upon the theory of evolution. We have not space for any abstract of his views, which are well-deserving of study, but must refer the reader who desires fresh evidence on the subject of evolution to the work itself.

We entirely agree with the author in his closing words: "In the case of too many naturalists the dogma or creed of natural selection has tied their hands, obscured their vision, and prevented their seeking by observation and experiment to discover, so far as human intelligence can do so, the tangible, genuine, efficient factors of organic evolution."

American Spiders and their Spinning Work. A natural history of the Orbweaving Spiders of the United States, with special regard to their Industry and Habits. By Henry C. McCook, D. D. Vol. I. Published by the Author, Academy of Natural Sciences of Philadelphia, 1889. 4 to., pp. 372.

The author of this sumptuous volume is so well known from his valuable and interesting works on the natural history of various kinds of Ants, and his charming little book, "The Tenants of an old Farm," that any productions of his pen are looked forward to with lively anticipation and keen interest. We are quite sure that no one of the subscribers to this, his latest and greatest work, has been in the least degree disappointed by this first volume of the promised three. Though spiders are not insects, we have no doubt that every entomologist, and indeed every lover of natural history in any of its departments, will deeply enjoy the perusal of this volume. We cannot give a better idea of its contents than by mentioning the subjects treated of. They are, first, the general classification, structure and spinning organs of spiders; the construction and armature of Orbweavers' snares; the characteristic forms and varieties of snares; unbeaded orbs and spring snares; the engineering and mechanical skill and intelligence of spiders; their modes of procuring food and habits in feeding; their fangs and poison bags; their modes of nest making and its development in various tribes; and finally the "genesis of snares." All these different subjects are fully illustrated with more than three hundred and fifty wood cuts. The second volume is to treat of the mating and maternal instincts, the life of the young, the distribution of species, etc.; and the third will be devoted to descriptions of the orb weaving fauna of the United States, with coloured illustrations of a number of species. The whole will form one of the most complete works of the kind in the English language. Entomologists will need to have long purses if they wish to possess all the literature of the day, and to procure for themselves such costly and beautiful books as Scudder's and Edwards's Butterflies and McCook's Spiders. We trust that all who can possibly afford it will aid the authors in their self-sacrificing enterprises by subscribing for their books, but those who cannot do so should us-

their influence with their local Scientific Societies and Public Libraries and induce those in charge to purchase these valuable works for the general benefit. We are glad to say that the Public Library in Toronto and our Entomological Society have set a good example in this respect and rendered these works available for many of our readers.

Entomological News and Proceedings of the Entomological Section of the Academy of Natural Sciences of Philadelphia. Vol. I., Nos 1-3.; January March, 1890.

We gladly welcome another addition to the serial publications on North American Entomology. There is plenty of room for this new monthly Magazine, as it takes charge of a field which we and others have been unable to cultivate fully. It is intended to bring before students and workers the news and gossip of the day gleaned from all quarters of the globe ; the contents of current literature ; abstracts of the proceedings of Societies, etc. We hope that the new venture will have the fullest measure of success, and enjoy a career of long continued prosperity and usefulness.

Report on Insect and Fungus Pests. No. 1. By Henry Tryon, Assistant Curator of the Queensland Museum. Published by the Department of Agriculture, Brisbane, Australia, 1889. I Vol., 8 vo., pp. 238.

We have perused with great interest this first work that we have seen on the Economic Entomology of Australia. Some of the pests referred to are very familiar to us here, for instance, the Codling Moth and the Woolly Aphis of the apple tree, while others are species closely allied to those which are very destructive with us. The report takes up the different fruits, vegetables and field crops that are most commonly cultivated in the colony, and describes the insects which especially attack them ; as far as possible the life history of each pest is given and remedies are suggested. The work is very carefully and thoroughly done, and will, no doubt, be of great value to the fruit-growers and farmers in that part of the world. Its usefulness would of course be greatly enhanced by illustrations of the insects treated of, but evidently there were difficulties in the way of procuring these that could not at first be overcome. Future Reports will doubtless be made more popular in this way. The author deserves much credit for the valuable book he has produced. We trust that the Queensland Government will give him all the assistance and encouragement possible in the prosecution of his studies in practical entomology, and enable him to continue a work that is of the utmost economic importance.

CORRESPONDENCE.

RARE CAPTURES.

Dear Sir: In my letter with this heading in the March number, p. 60, there is an omission of a word which quite alters my meaning. Line 6 of my letter should read, "I concluded that I had *not* seen it before." I took *Pædisca nisella*, referred to at the same time, last August, about twenty miles north of Hamilton, in the County of Halton. I found it sitting on the trunks of small birch and poplar trees.

J. Alston Moffat, Hamilton, Ont.

GRAPTA INTERROGATIONIS AT MONTREAL.

Dear Sir: I was somewhat surprised to see the capture of the above species at Montreal recorded as being an unusual and almost unknown occurrence (Feb. number, page 40). In Mr. Caulfield's list, Can. Ent., VII., 87, *Interrogationis* is given, "Rare; May (hibernated); July to October," and I have always considered it one of those species which are neither rare nor abundant. The first specimen I have any record of was taken by me in Mr. Trenholme's garden, Rosemount Ave., Cote St. Antoine, on Sept. 7th, 1886. In the fall of 1887 it was abundant at Mr. Trenholme's, and a number of specimens (all *Fabricii)* were taken; between that time and the present I know of about 40 other specimens being captured in various parts of the town, and I succeeded in rearing three separate lots of larvæ to imago during last fall, all feeding on elm leaves. The form "*umbrosa*" seems to be much rarer here than *Fabricii*, but a few have been taken by Mr. P. M. Dawson and other collectors. I saw a single specimen of *Interrogationis* at St. Rose, P. Q., July 6th, 1889, but was unable to catch it.

Albert F. Winn, Montreal, P. Q.

Errata.—The following corrections should be made in Dr. Hamilton's paper on "Balaninus" in the January number:—Page 1, line 23, and elsewhere, for "*proboscoideus*" read "*proboscideus*." Page 5, line 33, for "nostrum" read "rostrum." Page 6, line 34, for "three first" read "first three."

Mailed April 7th.

The Canadian Entomologist.

VOL. XXII. LONDON, MAY, 1890. No. 5.

NOTES ON "A REVISION OF THE GENUS ARGYNNIS," BY HENRY J. ELWES, F. L. S., F. Z. S., ETC.

BY W. H. EDWARDS, COALBURGH, WEST VA.

So much of the text of Mr. Elwes' paper as relates to North American species has recently been printed in Psyche (March), but the synonymic list, which is most important for a full comprehension of the state of mind of the author, was omitted. I applied to the editor of the CAN. ENT. to print this list, but it was found that it would occupy nearly one-half the space of a number, and it was not thought expedient to give it. In course of the present paper, however, enough of said list will be given to show the features of the whole. Mr. Elwes, in "revising," as he terms it, has cut the forty-two species enumerated in Group I., in my Catalogue of 1884, adding *Cipris* and *Semiramis*, described later, to fifteen; and in Group II., makes one of *Bellona* and *Epithore*. He says, page 560, (Psyche, 308): "The Argynnides of North America are, without exception, the most difficult butterflies to classify that I have studied. I have a collection which includes authentically named specimens of almost all the species and varieties, many of them direct from such well known collectors as Messrs. H. Edwards and Morrison, many from Messrs. Strecker and Geddes. I have also seen some of the best collections in the United States." * * * "It seems presumptive for a man to set aside much of what has been written by those who have seen, both living and dead, so many more specimens than I have seen, etc."

Undoubtedly it is a difficult group, and Messrs. H. Edwards and Scudder, with myself, have studied it long, but do not pretend to know completely some of the forms; and it seems odd that a stranger can skip from ocean to ocean and back again, stop here a day and there a week to ply his net, visiting a few collections, and those mostly second or third rate, getting his specimens "authentically named," in nearly all cases by

persons who never saw several of the described species, or have their knowledge at second hand, and on the strength of this pronounce judicially on the American Argynnides! One of my correspondents, a lepidopterist, not a mere collector, on reading the paper in Psyche, wrote me thus: "It is an amazing piece of presumption for a visitor to America to collect and buy a lot of specimens, and on the strength of that to denounce and try to overthrow the work of yourself and Scudder, who have been studying the butterflies for more than a quarter of a century, and must know a thousand times more about them than he possibly can." And another correspondent, of same character, says: "I think it a pity for a man to write on such a subject, unless he can throw some light on it."

Mr. Elwes gives the impression that he had studied the important collections of the country, but he never saw mine, nor that of Mr. Bruce (rich in the Colorado species), nor that of the American Entomological Society in Philadelphia, nor any collection on the Atlantic slope except Dr. Holland's, Mr. Neumoegen's, Mr. H. Edwards's and Mr. Strecker's. On the Pacific, those that he could have seen were local and small. It is known that I have sold my collection to Dr. Holland, but at the time Mr. Elwes visited Pittsburgh, the greater part of the rarer and less known Argynnides, and particularly those that have so perplexed this gentleman, had not been delivered. At Mr. Neumoegen's he scarcely glanced at the group, but gave all his time to the East Indian butterflies. He says himself that he "went through" Mr. Edwards' collection, but, as Mr. Edwards has not returned from Australia, I cannot learn at what pace, though I can imagine it. But he spent considerable time at Reading, and Mr. Strecker tells his friends that "he took copious notes," and that he "gave him many points." The paper shows as much.

I had cordially invited Mr. Elwes to visit me and inspect the Argynnides, but not finding himself able to come, he failed to see the most complete collection in the group treated of ever brought together, containing not only the types of all the species I had described, but every one of Dr. Boisduval's types of Californian species: in other words, of nearly every species described since 1852. Of the two species described by Mr. H. Edwards, and the four by Dr. Behr, I have examples named by them, and in most cases long suites, with all the varieties which during thirty years I had been able to bring together.

I could have shown Mr. Elwes the points of difference in difficult subgroups, and could have named all his specimens "authentically." But he preferred to take counsel of this and that "collector," with the plain result that his specimens are not named "authentically," and that his collection must be a hopeless jumble. It is clear as can be from his list that in half the cases he does not know what he is talking of. For example: "*A. Aphrodite*, *A. Cybele*, *A. Alcestis*, *A. Cipris*, *A. Halcyone*. This is a group of species or forms which are extremely hard to define; and though Edwards and Scudder, and most other North American Entomologists, agree in keeping them separate, I think it is very difficult, if not impossible, to identify them, unless you know their habitat." (One would think that such cases were unheard of elsewhere. Habitat is an important aid in determining between closely allied species, and zoologists in every branch, and botanists, take it into consideration.) I have a pretty good series of all, except *Cipris*, which must be very close to, if not identical with *Alcestis*, etc." Plainly, he does not know *Cipris* then, a species closer to *Aphrodite* than to *Alcestis*. "Either such experienced collectors as Morrison or Geddes did not know *Aphrodite* when they saw it out of its usual range, or *Scudder and Edwards are mistaken*." Truly, it does look so. However, it is not remarkable that the collectors named did not distinguish *Cipris*, inasmuch as, in their day of collecting, it had not been separated. "Mr. Edwards perhaps would say that my *Halcyone*, which were sent by Mr. Strecker, and taken near Denver, are not true to name; but what can they be from that locality?" Here it seems that locality helps him to decide on a species. "What can they be?" I can answer this pathetic appeal: *Halcyone* is not "taken near Denver," but *Cipris* is, and Mr. Elwes was viewing a *Cipris* undoubtedly. Now *Halcyone* does not belong to the *Aphrodite* sub-group, as anyone can see by the figure of the female in Butt. N. A., vol. 3, part IX. It has the peculiar cut of wings of *Edwardsii*, and great egg-shaped silver spots. So, here are two species our author is at fault about.

And he is bothered with *Chitone*, "sent by H. Edwards from Nevada," which "does not agree with W. H. Edwards' description on the under side" (which is the important side), "and is nearer *Nevadensis*." He never saw *Chitone*, a species not taken in Nevada, but in Southern Utah and in Weber Mountains, and totally different on both sides from *Nevadensis*.

A *Lais* "seems to me very near *Atlantis*"; and in the list, p. 546, he says "*Lais (Atlantis* var.?)," not being able to determine whether it is a species or a var. He never, in text or list, refers to the plate of *Lais*, in Butt. N. A., vol. 3, which, as well as the description, testifies to a species that cannot be confounded with *Atlantis*.

"There occur, however, in Nevada, forms which are described as *Laura* and *Macaria*, of which I have authentic specimens from Mr. H. Edwards, and which, by their under sides, seem to be *Coronis*." Then, in same connection, speaking of *Chitone*, as before quoted, he goes on: "None of these names can, in my opinion, be retained, except as synonymns, though they are *all kept up* in Mr. Edwards' Catalogue as distinct species." On this I remark that Mr. Henry Edwards is one of the few experienced lepidopterists who are well acquainted with the American Argynnides. He collected for several seasons in California and Nevada, and knows more of the living butterflies than any other one man. In doubtful cases I rely on his judgment above all persons. His collection does not embrace, by a good deal, all the described species; but, so far as it goes, it is complete, and each species is represented in long suites. This collection was undoubtedly the most important one Mr. Elwes visited. "In going through Mr. Edwards' collection, I noted *Columbia* as similar to *Hesperis*;" and on the strength of that casual glance one May morning, down goes *Hesperis* as *Atlantis* pure and simple, and *Columbia* as well but with a query, the usual confession of ignorance of its position. It takes something more than "going through" a collection in this fashion to make one's self acquainted with forty species, and giving the right to pronounce on them. In the present case, also, some deference might be thought due to Mr. Edwards' standing and experience. But, I doubt very much whether Mr. Elwes saw *Macaria*. So far as I know, it is not Nevadan, but is confined to the Greenhorn Mountains and Kern River region in South California.

"Whether *Montivaga* and its var. *Egleis* are really distinct from *Eurynome* and its varieties, is hard to say," p. 574. Who said *Egleis* was a var. of *Montivaga?* I am confident the author of this paper never saw *Montivaga*, unless under another name. It is neither *Egleis* nor *Eurynome*, but the same as *Arge* Strecker, which last is not *Erinna* at all, as anyone can see by reading the two descriptions. Mr. Mead, who has a keen eye for resemblances or differences, (alas, that he has gone over to the

botanists !) on his return from the summer's collecting in California and Nevada, 1878, went to Reading, and at once identified *Argc* as *Montivaga*, many examples of which he had taken at Tallac, Nevada. The description supports Mr. Mead's testimony. *Erinna* was unknown till five years after *Argc* was described, when the first examples were brought in from Washington Territory. Neither it nor *Eurynome* are Californian. In Butt. N. A., Vol. II., *Eurynome* is figured and its egg: in Vol. III., *Egleis* and its egg. Apart from the sufficient distinctness of the imagos, the different form of the eggs is decisive, though doubtless Mr. Elwes does not know it. There is no appreciable variation in the shape of the eggs of any species of Argynnis. Mr. Scudder relies implicitly upon this fact, even in the characterization of genera. If one is higher than broad, with a given number of ribs, all are ; if one is broader than high, all are. The egg of *Eurynome* is squat, as broad as high, with twenty ribs ; *Egleis* is tall, considerably higher than broad, with eighteen ribs. I may say here that nowhere in the paper do I find the least reference to the plates in Butt. N. A., except on page 574. When talking of *Bischoffii* and *Opis*, I read : " In Edwards' figures I can see no specific characters." In the list most of the plates are referred to, but in the text no one would suppose that any of these species had been figured, or that such figures as are given were of the least use in determining species. The author prefers to trust to his " authentically named " specimens.

On p. 536, he says he has not *Inornata* in his collection, and indirectly that he never saw it, but he " cannot recognize it as a species." Nothing further is said of it, but in the list it is put under *Callippe*, " ? var. vel trans. ad *Edwardsii*, vel ad *Zerene*, *Inornata*." *Edwardsii* in no one character resembles *Zerene*, and is Coloradan, while *Inornata* is found only in California. The plate shows it to be one of the most distinct species of the fauna. The male is as red as *Adiante*. *Callippe* has no red about it, but is dark and melanic. So that here *Inornata* is put down as related to three wholly unrelated species, under one of them, and *on its way*, " trans." to the other two !

A. Hippolyta, which is kept up" (a favorite and charming phrase !) " by its author as a species, and seems to be something intermediate between *Hesperis* and some form of *Zerene"* (all roads lead to *Zerene !)* " Its locality would indicate that it may be nearer to them than to *Atlantis*." (Observe the admission that habitat is worthy of considera-

tion!) But, in the list, p. 547, *Bremnerii* is put as a true species and *Hippolyta* as a synonymn of it—not even credited as a var.! It strikes me there is discrepancy between text and list. And *Rhodope*, also one of the most distinct species in the fauna, is put under *Bremnerii*, to which it has no relation, as "? var. *Rhodope*." The "authentically named" specimens have misled the author, and, as usual, the plate would have set him right.

"The species allied to *Monticola*, namely, *Zerene* and *Bremnerii*, have puzzled me quite as much as Edwards, Strecker and others. In *the damper climate* of Oregon * * * a darker form, *Bremnerii*, occurs, * * * and might be considered as the Pacific coast form of *Atlantis*, but in the specimens taken at Mt. Hood, the silver is absent, and these might well be considered a northern and darker form of *Zerene*." A characteristic sample of this author's hazy views of species! In the first place, I will say, that Edwards is not and has not been puzzled by the species in question. In the next place, that *Bremnerii* is not at all like *Atlantis*. In the third place, I had long suites of the Mt. Hood specimens from Morrison, receiving by pre-contract every variety and every species taken, and no *Bremnerii* was without silver. Nor in the many examples I have seen from Oregon and Vancouver, have I seen one that was not as fully silvered as *Cybele*. In the fourth place, Mr. Elwes has never seen a *Bremnerii* without silver. Doubtless, he is talking of *Zerene*. And in the last place, notwithstanding all his bewilderment and error of determination, he actually puts in the list *Monticola*, *Bremnerii* and *Zerene*, as three of his fifteen true species!

A. Behrensii is put under *Monticola* as "? var.," with this funny comment: "? trans. ad *Monticola*, vel. ad *Bremnerii*, nomen vix conservandum." Now, *Behrensii* resembles neither; it is one of the rarest of our species so far, and in all these years I have seen but four examples of it. I do not believe the author ever saw one. Here again the plates could have enlightened him.

So much for ignorance. There is another class of species, differing radically in colour, size, form, and in the shape and number of the silver spots, which, to our author's eye, look all alike. "*A. Leto* is a species which, though undoubtedly nearly allied to *Cybele*, is fully as distinct from it as *Nokomis*, and may be regarded as its Pacific Coast form in the

same way as *Nokomis* is the form (i. e. of *Cybele)* of the dry central plateau of the continent." He had already said that *Cybele* and *Aphrodite*, and several others, were all one species, and now gets into the same corral *Leto*, *Nokomis* and *Nitocris*, which last, he says, is nothing but a form of *Nokomis*. And he quotes the wise remarks of his friend and counsellor, Strecker, with approval: "I have always contended that *Nokomis* was a pale abnormal form of *Cybele*, of which we have so many other instances in other species, (I should like to see a statement of these other instances !) from the *dry salt regions* of Utah and Arizona," p. 568. Pity that Mr. Darwin had not lighted on that explanation of the origin of species ! The dry salt air changes the form of a species, changes its coloration throughout, changes the form of the silver spots, enlarges or decreases their number, lines the spots with heavy bars of black on both anterior and posterior sides. Thus a *Nokomis* is manufactured out of a *Cybele !* *Leto* is as unlike *Cybele* in shape, in the silver spots, their size and number, and in the colour of both sexes, as it is unlike *Zerene*. *Nokomis* female, on the upper side, is of the same pattern as female *Diana*, the spots being yellow, which in *Diana* are blue. *Leto* female, in place of the extra-discal oblong spots on hind wings, seen in the other two species, has a solid yellow band. To me it seems absurd to the last degree to be talking about the identity or even the nearness of the three species to each other. I happen to have bred *Leto* from egg to imago, and the larva has striking differences from that of *Cybele*. And how any one can look at the plates of *Nokomis* and *Nitocris*, and call them forms of one species, is past my understanding.

A. Semiramis "*to my eye* is nothing more than a form of *Coronis*, in which the black markings of the upper side have become paler and more reduced, *as might be expected* from the arid character of the country where it is found. It has been taken by Mr. Wright in the mountains separating the San Bernardino Valley from the Mohave Desert, and was not out when I visited these mountains in May, 1888." Why might it have been expected ? That strikes me as on a par with the reason given for transformation of species in Utah, the dry salt air ; and in Oregon, the damp climate. As it happens, the region where *Semiramis* is found is not on the desert side of the mountains, and Mr. Wright, in answer to my inquiry, denies the arid character, and says that no mountains are dry

there. "The winds all the year are from the Pacific; the desert is 20 miles away, across 5,500 feet of a mountain range."

"*A. Adiante* is a form which both Strecker and Edwards consider distinct. On the coast of Calif., according to Strecker's information, it is now extinct, and all the male specimens *(I have seen no females)* in Mr. Godman's and my collection were evidently taken many years ago. I should certainly be inclined to set it down as a variety of one of these species," *i. e. Zerene* or *Monticola*. "The opinions held twenty-five years ago, when Dr. Behr was an active collector, are not conclusive." In the list, under the true species *Zerene*, is set: "*? Hydaspe* Bdvl.; *? Irene* Bdvl.; *? Rupestris* Behr.; *? Adiante* Bdvl." Now *Hydaspe* is really a var. of *Zerene*. I have Boisduval's types of both. *Rupestris* is in no way related to *Zerene*, and in both these cases the author is unable to pronounce definitely. He does not know, confessedly, what they are; nor whether *Adiante* is a var. or not. In the text, he says he thinks it is a var. of either *Zerene* or *Monticola*. Well, which? Knowing nothing at all, he puts it as a ? var. of *Zerene*. Perhaps if one could cut down the wings of *Zerene* or *Monticola*, trim the edges a little, change the hue of the upper side, reduce to streaks all the heavy black markings or obliterate half of them, wipe out all the marks and spots of the under side, one could manufacture an *Adiante* that would seem the real article to the reviser of the Argynnides. For myself I am content with the species as nature made it. But this is the process by which 42 species are cut down to 15.

I could have shown Mr. Elwes recent specimens of *Adiante* of both sexes, and told him where to seek it. In 1889, a correspondent obtained eggs of it for me.

In the list, p. 545, we have under the head of true species *Aphrodite* Fabr.; "? var. *Alcestis: Cipris*" (put as a mere synonymn of *Alcestis)*, "*? Aphrodite* Mead" (which is neither more nor less than what, thirteen years after Mead's mention, was separated as *Cipris.)* But the gem of the group is put thus: "var. vel bona sp. *Nausicaa* Edw." It is either a var. or a good species, the author does not know which, but all the same it stands under *Aphrodite*, and another species is disposed of. If the author knows nothing, why not say nothing!

List, p. 541, "*Bellona* Fab.; var. *Epithore* Bdvl.; the fore-wings less

produced apically, the hind margin convex (in *Bellona* it is concave or sinuous), the base less obscured, beneath paler." If these characters are not enough on which to found a species, or separate two species, how much further must we look? But in addition there are other separating characters.

What are we to think of a transient visitor on the strength of his desultory experience "going through" such collections as he had access to, pencil in hand and carpet bag in the hall, and of his "authentically named" specimens from "experienced collectors," making a list after this fashion? Confessing at every step that he is lost, groping his way by query marks, uncertain whether to call a thing a var. or a good species; but, all the same, putting each incomprehensible form under something else. He laments his trouble, but can't approve of Edwards' way of getting over the difficulty (Elwes' difficulty) by creating other species, p. 566. Everywhere trans. ad *Zerene*, vel *Edwardsii*, vel *Monticola*, vel *Behrensii*, vel *Callippe*, vel *Meadii*, one species half the time trans. to at least two others. The result of this floundering is a paper and list on the lines of, and level with, Strecker's Catalogue! With a difference, however, in favor of Mr. Strecker: that no matter how ignorant he is, he never allows it, but is cock sure that *Cybele* and *Leto* and *Nokomis* are but the same thing; and Colias *Eriphyle*, *Philodice* and *Eurytheme;* and Satyrus *Nephele*, *Ariane*, *Boopis*, *Gabbii*, *Alope*, *Pegala*, *Wheeleri*, all one (vide Cat.). We do not find him dealing in query marks or alternatives. Such assurance is at least refreshing in contrast with the painful uncertainty and confusion of this paper.

Indefinite knowledge is definite ignorance, but when one is in the latter state, why take the world into his confidence?

I suppose, before Darwin, all naturalists were perforce lumpers of species. Each species was a little world with its group of satellites. But, since 1861, the view is changed, and in this country lumpers are nearly as scarce as dodos.

I myself am the reverse of a lumper in my method of work, and as I have always avowed the fact, my position is well understood. "I apprehend," says Prof. Owen, "that few naturalists nowadays, in describing and proposing a name for what they call 'a new species,' use that term to signify what was meant by it twenty or thirty years ago. * * * * The proposer

of the new species now intends to state no more than he actually knows ; as, for example, that the differences on which he founds the specific character are constant in individuals of both sexes, so far as observation has reached," etc. That is what I act on, and I believe the lepidopterists of this country do the same, as a body. In Can. Ent., 21, 235, 1889, Mr. Lyman says : " I hold very strongly that whenever a form is distinctly and easily separable from previously named species, it is entitled to be treated as a good species, and to be given a specific name, until it is proved to be only a variety by breeding," etc.

Dr. Holland writes, after reading Mr. Elwes' paper : " Your course in applying specific names to constant, or apparently constant, varieties, is proper, no doubt. The species so called may be relegated at a later time to the rank of a mere variety ; but science has been the gainer by the process." Professor Rivers, in his recent paper in Psyche, holds the same view. So does Mr. Grote in his new Check List.

In illustration of the two ways of working : In 1876, I described a certain yellow Colias from British Columbia as *C. Eriphyle*, being satisfied that it could not be *Philodice*, the then only described yellow species of the sub-group. In 1883, I named another yellow Colias from Colorado, that seemed to have distinct features, as *C. Hagenii*. Year after year I endeavored to get eggs of the Colorado form, and when at last I succeeded, the butterflies resulting showed that that *Hagenii* and *Eriphyle* were essentially the same thing, and both were a yellow form of the orange species *Eurytheme*.

Per contra, as an example of lumping without knowledge, quite after Mr. Elwes' own heart : Mr. Strecker, in his Catalogue, puts *Philodice* as a species, and *Eriphyle* as a variety of it—not only that, but *Occidentalis* and *Chrysomelas* as well, though these belong to a different sub-group from *Philodice*. Which was the more reasonable proceeding, to lump as varieties or synonymns several forms of which the lumper knew nothing, or to spot them as separate, and go to work to ascertain the facts ?

In the same way I had separated the two orange Colias, *Ariadne* and *Keewaydin*, as species, and when the opportunity came for breeding them, they were proved to be polymorphic forms of *Eurytheme*. So two of the polymorphic forms of Papilio *Ajax* were reckoned, not only by me, but by Dr. Felder, as distinct species, till breeding showed them forms merely, but deserving a name of course. By naming and separating a probable

species, attention is directed to it, it can never more be lost sight of, and sooner or later its true position will become established. But if several forms, of which nothing definite is known, are rolled into a lump, who can say that they will ever again be separated or even noticed!

In Mr. Elwes' revision of the genus Erebia he enumerated *Epipsodea*, and hesitatingly under it (with a query) a var. he thought worthy of a name, *Brucei*. He says he did not know whether to call this a var. or a species. He and Mr. Godman had each one specimen, and "it is so different from *Epipsodea that, had I more specimens*, I should be inclined to consider it a different species." So he puts it down as a var. with a query. If he had had more specimens—say one or two more—he would have done exactly what he is holding Mr. Edwards up to public reprobation for, put it as a species! Well, Mr. Bruce sent me eggs laid by the *Brucei*, and in due time one of them gave a typical *Epipsodea* imago. The indefinite knowledge has become definite.

On p. 569, larval characters are deprecated as a means of determining doubtful species, because the larvæ "are liable to vary" as much as the perfect insect. I will put my experience against the author's, and I say that the variation in the larvæ of each species of Argynnis is practically nothing.* They are as like each other as so many peas. When, therefore, I have reason to think, from the imago, that a certain form is a distinct species, as, for example, the one now known as *A. Cipris*, and which was called by Mr. Mead and myself the Rocky Mountain form of *Aphrodite*, but on my part always with doubts, if I can get eggs, I may find out the truth one way or the other. In case of *Cipris*, the larva and pupa showed a distinct species, and thereafter I had no difficulty in defining the geographical limits of *Cipris*. *Aphrodite* has a chocolate-brown larva and brown pupa, with no other markings; *Cipris* has both stages variegated and striped with yellow, and is as remarkable in its ornamentation

*There are many cases among the Heterocera, where the larvæ alone are relied on for distinguishing species, vide Weismann's Theory, p. 543, Eng. Ed. "In the Sphingidæ, cases are not wanting in which the moths are far more closely allied than the larvæ. This is especially striking in the genus Deilephila, eight species of which are allied in the imaginal state, in a remarkable degree, whilst the larvæ differ greatly from one another in color, and to as great an extent in marking." In the case of *D. Euphorbiæ* and *Niceea*, whilst the larvæ show great differences * * * the moths *cannot be distinguished with certainty*. The imago of the rare *Niceea* is, for this reason, wanting in most collections; it cannot be detected whether a specimen is genuine, i. e., whether it may not perhaps be a somewhat large example of *Euphorbiæ*."

as *Idalia*. Suppose I had followed the example of the lumpers and *Cipris* had been overlooked altogether! What gain would have accrued?

I will lay down another rule that is infallible in Argynnis. Each species has its own style of silver spots, and there is practically no variation throughout the species, or in the range of it. *Coronis* Behr. abounds in South California, flies in all the intervening States to Montana, and in Oregon and Washington, and varies as much in coloration of both surfaces as any American species. But take it where we may, the great egg-shaped spots are always the same. It does not follow, though, that every specimen with egg-shaped spots is therefore a *Coronis*. *Cybele* always has silver spots of its own type; so has *Leto*, so *Nokomis*. In no case does one of these species approach the other. In *Macaria* the spots are at their maximum, in *Chitone* at their minimum; yet, in the list, both are put down as vars. of one other species. I would commend a careful course of study in these points to the author of the paper.

Mr. Elwes is sure that Mr. Edwards "will one day regret" having "in his earlier years created a great number of synonymns." I am sorry that he should be pained on my account. I am as much of a sinner in my later years as in my earlier, and have within a week described two species of Argynnis, which Mr. Elwes will regard as either "vars. or bona sp., or trans. ad *Zerene*." "His later views, as expressed in such papers as he has written on *P. Napi* and its vars., and in Lyc. *Pseudargiolus*, give evidence of a correct appreciation of the variation of species," for which condescending and patronizing approval I am duly grateful. But the illustration of L. *Pseudargiolus* is not so pat as was intended. I named both L. *Violacea* and *Neglecta* as species, and figured them as such in Vol I., Butt. But, when eggs were got, the whole curious and complicated relationship was made out, and these forms and several others were proven to be polymorphic forms of the one species *Pseudargiolus*. And I will venture to say I proceeded scientifically from first to last.

With regard to *P. Napi*, all I attempted to do was to show how a parent species could originate distinct derivative forms, and though I called all *Napi*, yet the derivatives, every one of them, are good and true species, or dimorphic forms of species, breeding true, not intermixing, and in the next edition of my Catalogue I shall put them down as such. I think I can see how the derivation from a single form occurred, but the derivatives are now species, and at present entirely separated from the parent *Napi*.

Anyone who has collected, and studied, and bred butterflies for years will have ideas as to the limits of variation in each species, and he will judge forms newly presented to him by those which he already knows. The eastern Argynnids—seven species—show little variation except in size, and it is only *Cybele* and *Aphrodite* that show that, according as they are northern or southern. The others are remarkably constant. Neither of these species, whatever its variation, runs into another, or approaches another. No one but a novice can possibly mistake one for another. Judging by what I see of them, I do not expect to find much variation in the genus elsewhere, and in fact if there are any variable species in our fauna, they form the exception, not the rule. The greater part are certainly as well defined as *Aphrodite* and *Atlantis*. I believe all the 42 described species, unless perhaps *Clio*, to be good species, constant to type, breeding true. *Clio* may turn out by breeding to be a dimorphic form of *Eurynome*. I should be delighted to be the means of proving it, but till it is proven, I hold it as separate. As to *Artonis*, that it is distinct from *Eurynome* and *Clio* I have no doubt whatever. I know it is found abundantly where *Eurynome* does not fly, and of course it breeds to its own type.

On page 535, in this remarkable statement, when speaking of the Argynnides of all the world: "The difficulties in this genus are not so great as in Colias and Erebia, *except in the species* inhabiting the Rocky Mountains and Pacific States of North America, which run into each other in a most extraordinary manner. Most of the European species, though closely allied, are fairly distinct, and I have *only marked one species out of America as doubtful*." So far as relates to all the world, then, except these western districts of America, the rule I laid down holds good by Mr. Elwes' own admission, that the several species of Argynnis vary only within certain limits, and nowhere run into each other.

Mr. Elwes had only to make sure of his American species, which he could easily have done by seeing the original types, and he would have found his rule held good universally. But ignorant of the types, he started wrong, and trusting to what he calls authentically named specimens, received from experienced collectors, together with his lack of knowledge of the preparatory stages, or of what are the most important features of the imagos, he has landed where we find him.

THE BUTTERFLIES OF LAGGAN, N. W. T.; ACCOUNT OF CERTAIN SPECIES INHABITING THE ROCKY MOUNTAINS IN LATITUDE 51° 25′.

BY THOMAS E. BEAN, LAGGAN, ALBERTA.

THE LOCALITY.—Laggan is a telegraph station of the Canadian Pacific Railway, 956 miles west of Winnipeg as the railway runs, and six miles east of the British Columbia eastern boundary. A mile west of Laggan the railway leaves the Bow River Valley, and turns more directly west into the valley of Noore's Creek to cross the central range of the Rocky Mountains, the summit of the pass being six miles from Laggan. Directly east of Laggan, Pipestone Creek, flowing from the north, joins the Bow; its sources are about twenty miles to the north, among the crags of the Sawback Range, only a few miles distant from the headwaters of the Red Deer River. A short distance west of Laggan, Noore's Creek enters the Bow: this stream, although scarcely ten miles long, carries, on warm days, a great volume of water, derived from an extensive snow field on the eastern face of the Waputtehk Range. The Bow River itself, rising about latitude 51° 45′, flows southeast for a long distance in an elevated shallow valley parallel to the axis line of the Rocky Mountains, and close to the basal slope of the central range of peaks. At Laggan, the surface of the river, at its ordinary summer level, is but three hundred feet below the elevation of the summit of Kicking Horse Pass.

The entomological ground, whose butterflies I propose to speak of, is chiefly a limited district immediately around Laggan, comprising, on the east, the valley of the Bow to a distance of four miles, and on the west the same valley for two miles; embracing on the southwest the valley of Noore's Creek, and the summit valley of Kicking Horse Pass to a point about three miles west of the British Columbia boundary; and extending on the north from the level of the Bow to the peaks of the nearest of the "Slate Mountains." A less complete examination has been made for nineteen miles east along the railway, and above timber line upon mountains at Stephen and Hector; also between the Bow River and Emerald Lake, three miles south.

As regards continental position, Laggan is about one hundred and sixty-five miles north of the international boundary, on a line with the western boundary of Montana, in the same longitude as the Great Slave

Lake and the peninsula of Lower California. It is approximately in latitude 51° 26′ north, and its elevation above the sea is recorded as 5,005 feet, only 290 feet less than that of the railway summit at the head of Kicking Horse Pass, while it is nearly a thousand feet higher than Morley, at the edge of the mountain district, and over three thousand feet more exalted than Regina, in the region of the central prairies.

To aid an estimate of the climatal and zoological conditions of the Laggan district, certain facts may be mentioned, partly of a general nature and partly local. The latitude of Laggan brings it about in line with the Aleutian Islands, Moose Fort on James Bay, and York Point, Labrador, while it is almost two degrees more northerly than Anticosti Island, and about four and a-half degrees further north than the city of Quebec. The district is thus seen to be considerably more northern in position than any other equally accessible North American entomological field which has been as fully examined. This district is on the warmer side of the continent. Although so much further north than Mount Marcy in the Adirondacks, on which timber line occurs at 4,850 feet, and the White Mountains of New Hampshire with timber line at 4,250 feet, yet the mountains about Laggan lift their forests to a far greater altitude, the uppermost fringe of larches illuminating timber line in September with a soft yellow glow at a height of 7,000 feet. The difference in the climate of western British America from that of the eastern side is illustrated by the occurrence of rattlesnakes at the "Forks of the Red Deer River," in the warm plains east of the mountains; the locality is nearly due east from Laggan, and is in the latitude of Southern Labrador.

The *local* conditions of the Laggan district, however, are distinctly of a boreal tendency. So great is the altitude of the Bow Valley that the railway grade is but 2,000 feet below timber line; in the vicinity of Pike's Peak, Colorado, an equal relative position would be met with at an altitude of 9,700 feet. The valley of the Bow, indeed, is but a comparatively narrow pass, parting two great systems of chaotic upland, where peak is frozen to peak by an almost unbroken line of glaciers—every sunless height a field of snow, each shaded alpine abyss a gulf of ice. As may well be supposed, these frigid environments powerfully affect the summer climate of the region, and exert a controlling influence upon the night atmosphere even when the days are warmest.

Among the noteworthy features of the scenery may be mentioned:

Mount Hector, in the northwest; Mount Temple, about eight miles southwest, with a great field of snow and ice on its summit a mile above the valley; Mount Lefroy, seven miles to the south, and the glacier of Noore's Creek, nine or ten miles west; also Emerald Lake, three miles south of the Bow, and the various rapids and canons of the Bow and Pipestone.

For names and figures made use of, I am indebted chiefly to the "Geological Survey of Canada" and "Gannett's Dictionary of Altitudes."

Preliminary to a consecutive list of the Laggan butterflies, to be written when all the material is sufficiently understood, I propose now to present such details as are likely to be of interest in regard to some of the least familiar of these Western Alberta autochthones.

Colias Elis Strecker; its seasons and variations, with information in regard to the male :—

This fine butterfly was first collected by Capt. Geddes, who records the capture of the female at Laggan, on Aug. 1st, 1884—the only definite date I find in print. The reason the Captain did not find the male was because it was not lost, but gone before. Capt. Geddes also catalogues *Colias Meadii* Edw., as collected at Laggan in the season of 1884.

Mr. Strecker's description of *Elis* may be found in "Proc. of the Acad. of Nat. Sciences of Philadelphia" for 1885, pp. 24–25. Mr. Strecker says :—

"Capt. Geddes took about fifteen examples, all females, nine of the orange form, and about six of the white; but nothing that could possibly be considered as the male. The other examples of *Colias* captured in the same locality were lemon-coloured males and females probably of one species, and allied to *Pelidne*, but bearing no kinship to the above. The most remarkable and distinctive feature of this *C. elis* is the white female; as the species, I am positive, will be found, whenever the male is discovered, to belong to a group in which albinous females are unknown, its congeners being *Hecla*, *Hela*, *Staudingeri* and *Eogene*, species in which no instance of the pale female has yet been known to occur; all of which are found only at great altitudes, or at the North Polar Regions, and are in the male distinguished from the other red or orange species by the absence of the mealy kidney or oval-shaped spot on the upper surface of the costa of secondaries near the body.

"It is curious, in regard to these albinous females of the Coliades,

that in one group they should occur in one species only, whilst in another there should be but one species, *C. Meadii*, found also at great elevation, in which they do not occur ; and in yet another species, *C. Vautierii*, of the same group with the last mentioned *Meadii*, found in Chili, the female is always white, such a thing as a red one being entirely unknown."

I find nothing in print from Capt. Geddes as to the elevation at which he found his specimens of *Elis*. Mr. Strecker states it as ten thousand feet, but that is evidently incorrect : timber line in the region occurs at about seven thousand feet, and the habitable belt extends but little more than a thousand feet above that elevation, while comparatively few of the ultimate barren peaks reach a height of ten thousand feet. *Elis* is by far most frequent at a little over five thousand feet, and is often met with in appropriate localities up to about six thousand feet ; it is rarely seen much higher than about six thousand feet, and never in my experience found above the tree line.

In regard to the distribution of *Elis*, I have little information. It is known to me only as inhabiting a very limited district. Eastward it becomes less frequent quite abruptly, and I have not seen it further east of Laggan than four or five miles ; it probably drops out of the fauna entirely on the east within ten miles of Laggan. To the southwest, across the summit, I have found it only as far as Hector siding, three miles west of the height of land ; beyond Hector its territory cannot extend far, as the decrease of altitude on the west slope at the head of the pass is very rapid, amounting to one thousand feet in the first six miles. The entire extent of the range of *Elis* from east to west, as known to me, is not more than thirteen miles. As to the distribution north and south, along the central line of the mountains, nothing is known, but in that direction its empire may be extensive. An interesting problem it is : How far the domain of *Elis* extends north and south from its thinly settled reserve on the Bow ?—how far northward along the narrowing angle of the upper Rockies toward the wide-spread country of *Hecla* ?—and southward, how far across a thousand miles of intervening mountainous wilderness toward the ancient villages of *Meadii* on Colorado's cloudy summits ? Within the narrow limits of its known district, *Elis* is of general occurrence in localities where its food plant grows, though at few points is it ever anything but rare. A part of the best locality known to me was devastated by the fires just east of Laggan in June, 1889. *Elis* has partially established itself upon the high flats and hills between Laggan and the nearest,

mountains north, a district burned a few years ago, and will, no doubt become more frequent there in future years, as its food plant is abundant. At the summit, this butterfly and most others were well nigh exterminated in the summer of 1886 by the storm of fire which raged through the pass, sparing nothing but the little marshes and their inhabitants. Collecting there several times in 1888 and 1889, I saw scarcely a butterfly other than the two species of *Chrysophanus*, which live at the edges of the little swamps. These were as frequent at the summit as I found them in their resorts elsewhere. The larger butterflies, however, were lacking or were excessively rare, excepting only *Pieris occidentalis*, which seemed to have in some degree regained a footing.

The ♂ of *Elis* flies chiefly from about the 28th of June to the end of July. My initial date in 1886—an early season—was June 23. After July few ♂s are seen, and those few not newly out of chrysalis. The ♀s are abroad during a period about equal to that of the ♂s, but beginning and ending a few days later; my collection dates indicate a term of about five weeks, say from July 6th to August 10th or 12th. The ♂ is most frequent near the middle of July, and the ♀ a week or ten days later. The total period of the imago, including both sexes, varies in different seasons from a term of thirty-five to one of forty-five days: during the last five to ten days there are seen none in good condition—the females appear in faded finery, and rarely a tattered male lingers among the asters. There is but one flight in a summer. No indication of hybernation in imago or pupa has come to my notice. All the evidence so far obtained tends to show that the larva invariably hybernates at a very early stage, almost certainly at first stage, and that the species, in its habit of development, is a strict biennial.

Admitting *Elis* to be a distinct species, it is without doubt extremely near to *Meadii*, far closer than to any other well known form; this the ♂ especially proves. Probably its description as a distinct species was immediately due to the incident of failure to collect ♂s in the first instance.

Definite Characters of the ♂.—Material examined, twenty-nine caught specimens. The smallest measures 48 mm., or 1.9 inch; the largest is 57 mm., equal to 2.24 inches. These measures are obtained by adding the length of the two primaries (measuring from apex to centre of base of wing) and the breadth of the body. Average expanse of the twenty-nine individuals 51.2 mm., or 2.01 inches. This is a larger butterfly than *Meadii* or *Hecla*. It is smaller than *Christina*, or even *Alex-*

andra, being nearer the expanse of *Edusa*, *Myrmidone* and *Thisoa*, and to the last one it has a more than superficial resemblance. The border of primary varies greatly in breadth in different individuals, ranging from 2.5 to 4.5 mm. in my specimens, measured at middle of outer margin : this is an important point of contrast from *Meadii* ♂, in which the breadth of the border of primary, in different individuals, is peculiarly uniform. At apex the border is not usually so broadly produced proportionally as in *Meadii*, but more nearly as in *Hecla*. At inner angle, the border is generally much produced, in which it follows the method of *Meadii* and differs from *Hecla*. As a general statement, the border of both wings is relatively much less produced in *Elis* than in *Meadii*. In the shape of the border of primary, *Elis* differs from *Meadii* definitely, though slightly, but its difference from *Hecla* is emphatic and essential. A more detailed comparison between *Elis*, *Meadii* and *Hecla* may be attempted later, with a more ample material of *Meadii* for inspection. At present it may safely be said that *Elis* is on upper surface partly near *Meadii*, and in part more like *Hecla ;* that its resemblance to *Hecla* is comparatively superficial, while in essentials it is nearer *Meadii*, yet is not quite identical in the method of its pattern. On under side the differences between *Elis* and *Meadii* are not definite, nor very considerable. The cell-spot above primary is uniformly small, often sub-linear, and in six of the twenty-nine it is almost obsolete. Under hind wing the cell-spot is also small, but in five of the twenty-nine specimens it is faintly double. The presence of submarginal dark spots on under surface is scarcely to be called a feature of *Elis*, though slight traces of this submarginal row occur in twelve of the specimens. The same is true as to the " patch," or cluster of dark scales, found on costa beneath secondaries in many species of *Colias ;* in *Elis* it is but feebly exhibited, traces of it being found in only seven of the twenty-nine males. Details of this kind do not constitute very interesting reading, but they are important. Such features as the cell-spots of both surfaces, the submarginal row of spots, and the costal " patch " on under side, and the nature of the marginal border on upper surface of wings,—when their averages in the several *Colias* forms have been fully collated from ample representative material of both flown and bred specimens—will prove to be efficient criteria in determining the standing of these forms.

(To be continued.)

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 75, Volume xxii.)

Genus NEMEOPHILA Steph.

1830—Steph., Ill., Brit. Ent., Haust., II., 72.
1855—Wlk., C. B. Mus., Lep. Het., III., 623.

Head small, not retracted, with rough vestiture. Eyes small, yet somewhat bulging or prominent. Tongue moderate in length, but weak. Palpi short, straight, scarcely projecting beyond the clypeus, clothed with short, thin vestiture. Ocelli present. Antennæ moderate in length, the ♂ rather lengthily bi-pectinated. Legs unarmed, subequal, the posterior longest, rather closely scaled, the spurs distinct.

Primaries with accessory cell distinct, giving off 7-10 from its apex, 4 and 5 close together, well separated from 3.

Secondaries with 3, 4 and 5 almost equidistant from the end of the submedian ; 6 and 7 together from the end of the subcostal, which latter gives off 8 from about the middle of its course.

The species in this genus are variable and the relation of the described forms is by no means fixed. As usual I follow Mr. Grote's List, without, however, intending to subscribe to the correctness of the synonymy.

N. geddesi Neum.

1883—Neum., Papilio III., 137, *Nemeophila.*
Habitat—N. W. Brit. Col.

N. modesta Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 113, *Platarctia.*
1882—Grt., New List, 16, *Nemeophila.*
Habitat—California.

N. petrosa Wlk.

1855—Wlk., C. B. Mus., Lep. Het., III., 626, *Nemeophila.*
1872—Pack., 4th Rept. Peab. Ac. Sci., 85, *Nemeophila.*
1874—Streck., Lep. Rhop., et Het., I., 79, =*plantaginis.*
1878—Streck., Pr. Dav. Ac. Sci., II., 272, pl, IX., ff. 2-4, =*plantaginis* Linn.
1879—Strk., Rept. Chief Eng., 1878-79, V., p. 1859, =*plantaginis.*
1882—Stretch, Papilio, II., 92 (variations), *Nemeophila.*
var. *cæspitis* Grt. & Rob.

1868—Grt. & Rob., Trans. Am. Ent. Soc., I., 337, pl. VI., f. 43, *Nemeophila.*

1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 75, *Nemeophila.*

1873—Grt. & Rob., Trans. Am. Ent. Soc., IV., 248, *Nemeophila.*

1879—Strk., Rept. Chief Eng., 1878-79, V., 1859, =var *plantaginis.*

var. *cichorii* Grt. & Rob.

1868—Grt. & Rob., Trans. Am. Ent. Soc., I., 338, pl. VI., f. 44, *Nemeophila.*

1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 75, *Nemeophila.*

1873—Grt. & Rob., Trans. Am. Ent. Soc., IV., 428, *Nemeophila.*

1879—Strk., Rept. Eng , 1878-79, V., 1859, =var. *plantaginis.*

var. *geometrica* Grt.

1865—Grt., Proc. Ent. Soc., Phil., IV., 318, pl. II., f. 1, *Eupsychoma.*

1872—Pack., 4th Peab. Rep., 86, =*petrosa.*

1875—Pack., Rept. Geol. Surv. for 1874, 559, *Nemeophila.*

1878—Strk., Proc. Dav. Ac. Sci., II., 272, pl. IX,. f. 3, *plantaginis.*

1879—Strk., Rept. Chief Eng., 1878–79, V., 1859, *plantaginis.*

1879—Grt., Can. Ent., XI , 209, *Nemeophila.*

geometroides G. & R.

1868—Grt. & Rob., List N. A. Lep., p. VIII., *Eupsychoma.*

ab. *hospita* Schiff.

1878—Strk., Proc. Dav. Ac. Sci., II., 272, *Nemeophila.*

Habitat—Calif., Rocky Mts., Colo.

A very variable species. Mr. Strecker mentions the early stages in his paper in the Rept. Engin. for 1878–79, and refers everything to *plantaginis.* How far he is correct I will not venture to say at present; but this much I can say, I have never in all the series seen by me found anything which was like the series of European specimens. That all these names refer to one variable species is not, I think, disputed.

N. scudderi Pack.

1864—Pack., Proc. Ent. Soc., Phil., III , 113, *Platarctia.*

1872—Pack., 4th Rept. Peab. Ac. Sci., 86, *Nemeophila.*

Habitat—Brit. Amer., Calif.

N. selwynii Hy. Edw.

1885—Edw., Can. Ent., XVII., 65, *Nemeophila.*

Habitat—Ontario.

Genus Seirarctia Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 119.
1873—Stretch, Zgy. & Bomb., 81.

Antennæ of ♀ short, with joints marked but scarcely serrate, the sides ciliated. Head moderate in size, closely applied to the thorax, but not sunken. Tongue obsolete. Palpi short, third joint equal to the second in length, not much exceeding the first; straight. The eyes are rather large, but not prominent. Ocelli present. Vestiture long and hairy. Legs short, fore-tibiæ shorter armed with a long claw at tip, middle and posterior tibiæ nearly equal in length, each armed with a pair of short terminal spurs only.

No male has been under examination, and I cannot therefore speak of the characters of that sex.

Primaries without accessory cell, seven to ten on a stalk out of the end of the subcostal at the same point with six; ten from nearest to base of stalk to costa; seven next to outer margin; eight and nine forking close to tip, the former to apex, the latter to costa; four and five together from the end of median; three from median some little distance before the end. Secondaries six and seven together from end of subcostal; four and five together from end of median; three some little distance before the end; eight, as usual, from about the middle of subcostal.

These studies were all made on a ♀, *S. echo*.

S. clio Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 120, *Seirarctia*.
1872—Stretch, Zyg. & Bomb., 82, pl. 3, f. 1, *Seirarctia*.
1882—Behr.,* Papilio II., 187, biol. notes.
Habitat—California.
Food plant—*Apocynum androsænifolium*.

S. echo Sm. & Abb.

1797—Sm. & Abb.*, Ins., Ga., II., 135, pl. 68, *Phalæna*.
1816—Hübn., Verzeichniss, 184, *Estigmene*.
1856—Wlk., C. B. Mus., Lep. Het., III., 668, *Spilosoma*.
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 531, *Hyphantria*.
1862—Morris, Synopsis, Supplt., 342, *Spilosoma*.
1864—Pack., Proc. Ent. Soc., Phil., III., 120, *Seirarctia*.
1865—Wlk., C. B. Mus., Lep., Het., XXXII., 352, *Hyphantria*.

1889—Slosson*, Ent. Amer., V., 153, larval habits.

1890—Slosson*, Ent. Amer., VI., 8, larval habits.

Habitat—Georgia, Florida, Dist. Col.

Food plants—Oak, Persimmon, Palmetto : omnivorous.

Seirarctia bolteri does not belong to this genus, and has been referred by its describer to *Halisidota ambigua*.

Genus *Ectypia* Clem.

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 529.

E. bivittata Clem.

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 530, *Ectypia*.

nigroflava Graef.

1887—Graef., Ent. Amer., III., 43, *Spilosoma*.

Habitat—Texas.

A poor specimen of this species is in the collection U. S. National Museum, also from Texas. I did not recognize it as Clemen's species until I had identified it with Mr. Graef's description. Mr. Hy. Edwards subsequently called Mr. Graef's attention to the probable synonymy, and there remains no doubt that Clemens' species is again known in collections. I have no notes on the genus, and believe it will either not prove a good one or some other must fall in with it.

Genus Pyrrharctia Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 120.

Head small, somewhat retracted. Tongue short and weak. Palpi very short, scarcely reaching the front. Antennæ very short, simple in both sexes. Legs stout, moderately long ; spurs short, middle tibiæ with one, posterior with two pairs. Fore tibiæ without armature. Claws with tips toothed.

In venation this species does not differ from *Leucarctia*, which will be fully described in this respect. The remarkable male characters of this genus have been described and figured by me.

P. isabella Sm., Abb.

1797—Sm., Abb.*, Lep., Ga., II., 131, pl. 66, *Phalæna*.

1816—Hübn., Verzeichniss, 184, *Estigmene*.

1833—Harris, Cat., Ins., Mass., 591, *Arctia*.

1841—Harris*, Rept. Ins., Mass., 59, *Arctia*.

1855—Wlk., C. B. Mus., Lep. Het., III., 611, *Spilosoma*.

1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 531, *Spilosoma*.

1862—Harris*, Inj. Ins., Flint ed., 335, f. 170, *Arctia.*
1862—Morris, Synopsis Lep. Supplt., 340, *Arctia.*
1862—Clem., App. to Morris Syn., 352, *Spilosoma.*
1863—Saund., Syn. Can. Arct., 16, *Spilosoma.*
1864—Pack., Proc. Ent. Soc., Phil., III., 121, *Pyrrharctia.*
1869—Saund.*, CAN. ENT., I., 26, *Spilosoma.*
1870—Riley*, Am. Ent., I., 48, *Arctia.*
1871—Riley*, Am. Ent., II., 182, f. 112, *Arctia.*
1872—Riley*, 4th Rept. Ins., Mo., 113, f. 65, *Arctia.*
1873—Edw.*, Proc. Cal. Ac. Sci., V., 187, 370, *Pyrrharctia.*
1876—Moeschl., Stett. Ent. Zeit., 37, 297, *Pyrrharctia.*
1878—Mann*, Psyche, II., 270, *Spilosoma.*
1880—Riley*, Am. Ent., III., 133, f. 51, *Arctia* (life hist.).
1881—Riley*, Gen. Index to Mo. Rep., 55, *Pyrrharctia.*
1882—Coleman*, Papilio, II., 18, *Pyrrharctia.*
1883—Weed, Papilio, III., 84, *Pyrrharctia.*
1884—Bean*, CAN. ENT., XVI., 67, *Spilosoma.*
1886—Smith, Ent. Amer., II., 79, *Pyrrharctia.*
1888—Dimmock (A. K.)*, Psyche, IV., 281, *Spilosoma.*
Coleman, Journ. Bost. Zool. Soc., I., 28, *Spilosoma.*

californica Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 121, *Pyrrharctia.*
1872—Pack., 4th Rept. Peab. Ac., 86, pr. syn.
1873—Butler, Cistula Ent., II., 39, pr. syn.
Habitat—United States and Canada.
Food plants—Omnivorous.

(To be continued.)

CORRESPONDENCE.

ERRATA TO THE REVISED CHECK LIST OF N. AM. NOCTUIDÆ.

Dear Sir: Although the list was nearly three months in press, from end of December to beginning of March, and I had a large number of proofs, I find that three mistakes escaped correction which I desire to note in this place:—No. 211, for *Harv.* read *Harr.;* No. 359, for *Harv.* read *Harr.;* No. 802, for *Grt.* read *Morr.* Students using the list will please note these necessary changes.

April, 1890. A. R. GROTE, Bremen, Germany.

Mailed May 2nd.

The Canadian Entomologist.

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THE NOCTUIDÆ OF EUROPE AND NORTH AMERICA COMPARED.

(Seventh Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

We have now passed in brief review the bombyciform *Noctuidæ*, or *Thyatirinæ*, and the typical *Noctuidæ*, or *Noctuinæ (Noctuæ nonfasciatæ)*. The former group differs in certain details of the neuration, and the question comes up as to the value of this character for classification. In all other respects, this small assemblage of moths must be considered as belonging to the *Noctuidæ*. The palpi, though short, have the Noctuid form. The eyes are sometimes naked, sometimes hairy. The legs, though somewhat short, are not unlike those of other owlet moths ; the fore pair have a tibial epiphysis so far as known to me. The fore wings are subtriangular with pointed apices. The resemblance to the *Notodontinæ* is seen in the neuration of primaries where vein five is intermediate, though this vein is sometimes wanting in the Bombycid group. But in *Nolaphana*, which Fitch considered a Tortricid, Zeller at first a Nolid, vein five seems also intermediate. This character of vein five of fore wings is, perhaps, of more value than the variations of the secondary costal veins. The difference in the position of vein seven of hind wings is, perhaps, not so important when we see that, in *Stilbia* and *Rivula*, vein eight springs from seven, the upper margin of the median cell. This is also the case with *Cerathosia*, and we may briefly consider the position of this moth. The name is derived apparently from the Greek *Keras*, a horn, in allusion to the clypeal tubercle perhaps ; and *thosia*, whatever that may be, I know not. It looks like a piece of *Lithosia*, a name derived from the Greek *lithos*, a stone, so that it might seem as though Mr Smith intended

to classify the moth as a Lithosian before asserting it to be an Arctian, "next to Utetheisa." I have already pointed out Mr. Smith's misstatements as to the neuration. These corrected, we have before us a Noctuid in all structural characters, except that the secondaries have vein eight of seven; but thus also paralleled by *Stilbia*. On the fore wings vein five originates near four, and runs nearer four than six. The clypeal tubercle and the legs, with a claw on fore-tibiæ, recall, as I have said, the *Stiriini*, and, so far as I can see from my six specimens, the tegulæ do not lie close to the thorax. But the squamation resembles that of *Tarache*, and we may place the moth after this group and before *Spragueia* and the *Eustrotiini*. Since 1868, I have been occupied in bringing our *Noctuidæ* into natural genera, founded on characters exposed by Lederer, characters used also by prominent recent specialists, such as Prof. Fernald and Lord Walsingham. It is therefore ridiculous for Mr. Smith to accuse me of ignorance of Lederer's definitions. But it will be better not to discuss any further Mr. Smith's remarks on this genus. The question whether relatively slight variations in the neuration can establish natural families in the Lepidoptera, is not to be decided after the fashion of Mr. Smith, but must be reasonably discussed. I have shown cases of individual variation in neuration, and science has not yet removed the scales and studied the veins of all the species of moths. We must not fall into the fault of tucking away an insect under a scientific label, but constantly occupy our minds with its various characters until its affinities become clear to us.

We may now enumerate the tribes into which I have divided the *Noctuinæ*. It may be premised that the genera thus associated may, in some instances, need transference. The limits between certain of these tribes seem faint, and I have had to rely often on somewhat vague and general characters for their definition. Unlike the Coleoptera, the investigator of the Lepidoptera is often at a loss to find structural features, so uniform is the general character, so soft the body parts, clothed with dense hair and scales, difficult to remove so that the external skeleton be studied. I have recognized the divisions of tribes, sub-families and families, and have endeavored to follow Leconte in his classification of the Coleoptera in my nomenclature. I think we should make a distinction between the characters employed for these divisions, and that we should not allow for a subordinate structural character a "family" value. On

this head the student is referred to a most valuable paper by Dr. Packard on the *Noctuidæ*, published in the Proceedings of the Portland Society of Natural Sciences, I., 153. This paper should be reprinted. It speaks of the natural value of the great families of moths, and contains statements of fact and admonitions to students, which can only be disregarded to the detriment of the study. From the relative intangibility of the structural characters of butterflies and moths, arises some necessary latitude of opinion. In no case is there any excuse for an improper criticism of the opinions of older or of more experienced writers. Rather is there room for a gentler treatment of this subject of our moths, these pretty locks of nature's fleece, so tender and so fleeting! In the paper above alluded to, Dr. Packard complains of the effect of amateurism on the literature of the science. No doubt in one sense the remark is well founded, but this amateurism is rather a proof of the attractiveness of the study and its aesthetic value. For my part I should be glad of the largest possible accession to the ranks of butterfly hunters and students, and I have tried always to do what I could toward creating a larger interest in this field. Elsewhere I have drawn attention to the greater general interest felt in England on the subject, and how valuable an addition to the charms of life the collection of butterflies and moths is proved to be. For this reason I have favored the gradual use of English names, and I have looked forward to the time when the distinction between "amateurs" and "scientists" should be obliterated by good work being done on all hands. Far more do I incline to disapprove of the work of those, whose temperament and training allow them to misrepresent what others have said and done, in order to ease their wounded vanity, or rise by improper criticism. Let us forsake such conduct. We are, as Mr. Scudder would call us, Aurelians, although this title smacks a little of the hobby, and it were well if our kinship in interest would make us kind. There cannot be an agreement, as the world is infinitely diverse.

The tribes of Noctuinæ I have defined are:—1, *Bombycoidi;* 2, *Apatelini*, including *Bryophila*, although the disposition of the American genera is not settled between these two first tribes; 3, *Agrotini;* 4, *Dicopini*;* 5, *Hadenini;* 6, *Arzamini*;* 7, *Nonagriini;* 8, *Scolecocampini;* 9, *Nolaphanini**, only *Nolaphana;* 10, *Caradrini;* 11, *Orthosiini;*

* These groups do not occur in the European fauna.

12, *Calocampini*, only *Lithophane (Xylina)*, *Lithomia*, *Calocampa* and *Xylomigis;* 13, *Cleophanini*, only *Cleophana*. I regard *Nyctophœata* as a Heliothid; 14, *Cucullíini;* 15, *Eurhipiini;* 16, *Ingurini*;* 17, *Anomiini*;* 18, *Litoprosopini*;* 19, *Calpini;* 20, *Stiriini;* 21, *Plusiini;* 22, *Heliothini;* 23, *Tarachini;* 24, *Cerathosiini;* 25, *Eustrotiini;* 26, *Hyblœini.*

There remain to be considered the geometriform *Noctuidæ*, or the *Catocalinæ (Noctuæ fasciatæ)*, the pyralidiform *Noctuidæ*, or the *Deltoidinæ* and a small sub-family group, the *Brephinæ*, containing only two genera, with few species, found in northern latitudes and elevations over Europe, Siberia and North America, a relic of a preglacial fauna. The genera are *Brephos* and *Leucobrephos.*

As may be drawn from the above names applied to the leading groups, the *Noctuidæ* are a large family, with various resemblances to the surrounding families of moths. The Owlet moths touch the Spinners, the Spanner and Sparkler moths, while the typical *Noctuinæ*, from their total form and embryology, bring the whole family, in a linear arrangement, between the two first. In number of species and structural variation the *Noctuidæ* yield to no other in interest, and its large representation in North America commends it to the attention of the student. For the student I have at least originally shown the way his studies in this group should be carried on. The matters of detail have not always seemed so important to me as the method, and this method I have originally introduced into the study, combining my reading with observations under the microscope. There is growing up a tendency, especially in Europe, where the living material is wanting, to engage in a sort of book working of nature. The new student constructs, out of the writings and pictures of others, some new turn to our views of life and variation, fancying even that Darwin may be damaged by such methods. It is vanity displayed in vain.

Sub-family *Catocalinæ.*

The earliest recognition of this group which I find in literature is that of Borkhausen, who calls this *Noctuæ fasciatæ*, in contradistinction to the *Noctuinæ*, or *Noctuæ nonfasciatæ.* These terms are clumsy and had better give way to those proposed by Packard (Proc. P. S. N. H., Vol. I., 153, et seq.). The wings are broad; primaries triangulate; secondaries

full, tending to be marked by continuous bands. The eyes are naked; antennæ generally simple; body usually untufted; abdomen smooth and tapering; the dorsal surface rarely crested; the tibiæ not unfrequently armed. Packard says that the epicranium is longer than in the *Noctuinæ*. The basis of this sub-family is comparative form. No single structural feature holds the genera together, and Lederer does not recognize its existence. Nevertheless the moths and larvæ seem to me more or less readily distinguishable, and that we may retain the sub-family term. Dr. Packard says (l. c.) that these two sub-families "agree in the main with the *Trifidæ* and *Quadrifidæ* of Guenèe, though the use which he makes of the venation seems to us to lead to artificial distinctions. The very constant venation of this family does not admit of any variation in the grouping of these veins and their branches, and hence they offer characters of secondary importance." With this statement my experience fully agrees. I do not think that the venation alone should decide family position. There are already too many exceptions known to the system of Herrick-Schæffer, which is, in some cases, considered the test of family character by Lederer. I regard this paper of Dr. Packard's as of fundamental value in the study of the *Noctuidæ*; the author, however, excluded the Deltoids, which, I think, from *all* their characters are *Noctuidæ*. It is not at all clear also, whether Dr. Packard considers the *Thyatirinæ* as a distinct sub-family group. Probably not, and that they are merely a tribal division of the *Noctuinæ*. To this view I should not seriously object, although I do not venture to decide upon it. The unequal characters by which we separate the *Thyatirinæ* and *Brephinæ* from the rest of the *Noctuidæ* are an objection to Lederer's classification. In the present series of papers the object is mainly to compare the fauna and the full discussion of this and similar points, must be left to a future occasion. Primarily this sub-family falls into two groups:—First, the tribe *Catocalini*, in which the secondaries, though often gaily coloured, are covered by and subordinated to the primaries. The European genera belong chiefly to this tribe. Secondly, the *Pheocymini* (*Pheocyma*, *Homoptera*, *Erebus*, etc.,) in which the secondaries are partially exposed and marked like the forewings, decidedly geometriform moths. The larva thus first becomes geometriform as we recede from the higher *Noctuidæ*, and then the perfect insect follows suit.

NEW NORTH AMERICAN HOMOPTERA.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

Idiocerus cratægi, n. sp.

Soiled white. Antennal depression, a dot on each ocellus, a pair of large round spots on the vertex, an angular spot behind each eye, the basal angles of the scutellum, the tergum and disc of the pleural pieces, black ; the elytra whitish hyaline generally with fuscous nervures. Length about 6 m.m.

Front slightly convex, the sides gradually converging to the rounded apex. Clypeus narrow, at the apex abruptly but not widely expanded ; loræ rather narrow ; outer margins of the cheeks feebly concave. Pronotum short, hind edge obscurely concave, the posterior angles rounded.

Colour soiled whitish ; tinged more or less with yellowish green on the margins of the vertex and face, sides of the pronotum, scutellum, basal and costal nervures of the elytra, and on the connexivum. A curved longitudinal cloud on each side of the front, and two subtriangular oblique spots between the ocelli, brown ; these marks may be obsolete, or they may be deepened to piceous black in places. A narrow triangular spot below the antennæ, a dot on each ocellus, and a large round spot above the latter on the vertex, deep black. Eyes brown. Antennæ white, setæ brown. Pronotum with an oblong black spot on the anterior margin behind the inner angle of each eye, disc sometimes with an indistinct brownish cloud. Scutellum with a large triangular spot within each basal angle, and two dots before the transverse depression, black ; the middle of the anterior field sometimes clouded with brown. Elytra whitish hyaline, ordinarily with heavy brown nervures ; the shoulder, commissure and claval suture yellow, costal nervure at base brown. Wings slightly smoky, iridescent ; nervures brown. Pleural pieces black, edged with pale yellow. Legs soiled white, tarsi black. Tergum black ; connexivum yellow ; venter yellowish, sometimes clouded with brown, laterally ; pygofers in both sexes black, edged with pale.

Genital pieces, male : Last ventral segment large, subtriangular, convex, longer than the two preceding, and covering the pygofers for about

half their length ; the latter broad and short, almost cylindrical, meeting on the ventral aspect nearly to their tips, thus forming a small opening around the anal style, a little separated basally beneath the ultimate ventral segment ; plates slender, weak and flaccid, but slightly exceeding the pygofers in length, fringed with long soft hairs. Female : Last ventral segment as in the male, except that the apex is truncated or slightly concave ; pygofers short and thick, the blunt apex but little exceeded by the ovipositor.

Buffalo, N. Y., July and August, occasional on thorn bushes ; Hamilton, Ont., James Johnston, Esq. Described from five male and six female examples.

Allied to *I. lachrymalis*, from which it can be readily separated by its smaller size, different markings, and the form of the genitalia.

L'Abbe Provancher, in his Petite Faune Ent. du Canada III., p. 288 (Jan. 1890), describes a very pretty little species of *Idiocerus* as *Bythoscopus clitellarius* Fitch, with the reference " Third Rept. Inj. Ins. p. 69"; this should have read No. 69, and may be found on p. 365 of the Trans. N. Y. State Agl. Soc. for 1856. Fitch, however, here refers to *Jassus clitellarius* Say, a species of *Thamnotettix* and not to the insect described by M. Provancher, for which I now propose the name *Idiocerus Provancheri*. This conspicuous little insect pertains to the group represented by *I. maculipennis* Fitch. It is not uncommon here at Buffalo on oak and other bushes through June, July and August. I have also taken it at Muskoka, Ont., and have seen examples captured at Hamilton, Ont. by Mr. James Johnston.

Since the publication of my paper on Pediopsis in Ent. Am. for Sept., 1889, I have received from M. Provancher a pale example of *Bythoscopus fenestratus* Fitch., labelled *Pediopsis flavescens* Prov., and accompanied by a note stating it to be a typical example. It agrees well with his description in the Nat. Can., IV., p. 376, Dec., 1872, and it is the insect described as *Pediopsis flavescens* on p. 295 of the Petite Faune Ent. du Can., Feb., 1890. This, therefore, leaves the insect described by me as the *flavescens* (Ent. Am., V., p. 173, No. 7) without a name. It is a well characterized species, and may be called *Pediopsis canadensis*.

PLATYMETOPIUS FRONTALIS n. sp.

Smaller and shorter than *P. acutus*. Blackish fuscous, sparingly irrorate with pale ; face pale yellow. Length about 4 m.m.

Vertex shorter than in *acutus*, one-quarter longer than broad between the eyes, with a longitudinal depression, apex obtuse. Cheeks broader, and the clypeus shorter and broader than in *acutus*, the sides of the latter almost rectilinear. Head, scutellum and abdomen, closely punctured. Pronotum smooth, obscurely transversely wrinkled. Last ventral segment of the male rather deeply concave, valve large and rounded ; plates triangular, on the impressed suture about as long as the valve, apex subacute, margins sparsely ciliate ; pygofers elongated, surpassing the plates. Last ventral segment of the female broad, slightly keeled and compressed apically, the hind edge feebly notched on the middle, pygofers short and broad, scarcely exceeded by the ovipositor.

Colour fuscous, or almost black ; posterior disc of the vertex, pronotum, scutellum, and all beneath, minutely but sparingly irrorate with pale ; vertex and venter of the male almost immaculate. Apex of the vertex whitish, with some irregular fuscous lineations on either side of the central line ; face yellow, cheeks infuscated exteriorly, base of the front with but faint indications of the concentric lines characteristic of our other species. Pronotum, with five whitish longitudinal lines, faintly indicated. Nervures of the elytra bordered with interrupted pale lines that sometimes form reticulations on some of the areoles ; costal area outwardly whitish hyaline, crossed by about eight oblique blackish veinlets ; apical areoles, excepting on their base fuscous, the extreme edge pale. Elytra normally with about fifteen round whitish dots placed on the ends of the areoles, but more or less of the basal are frequently wanting. Wings sordid hyaline, nervures fuscous. Tibiæ spotted with pale ; tarsi pale, the joints tipped with black.

Described from two ♂ and five ♀ examples. Buffalo, N. Y., June and September ; Ames, Iowa, (H. Osborn).

I have swept this species from low bushes and weeds with *P. acutus*, from which it may readily be distinguished by its smaller size and blackish colour. *P. acutus* has the sides of its clypeus concave, and the apex of the valve of the ♂ obtusely pointed. *P. modestus* Stæl is unknown to me, as is also *P. magdalensis* Prov., but these are larger pale species.

DESCRIPTION OF A NEW SPECIES OF ARGYNNIS FROM CANADA.

BY W. H. EDWARDS, COALBURGH, WEST VA.

Argynnis Alberta.

Belongs to the *Chariclea* group.

Male.—Expands 1.9 inch. Upper side pale yellow-fulvous; the markings as in *Helena*, but pale black, reduced; the mesial stripes on both wings interrupted, macular; the extra discal rounded spots on primaries minute, the sub-marginal crescents wanting, and represented by small clusters of scales at the summits only, leaving a clear space to the margin, which margin is edged by an even stripe; on secondaries the rounded spots are larger, and the crescents are represented by larger clusters of scales; the marginal border is extended on each nervule so as to encroach on and make narrow the clear space. Under side of primaries pale red-brown, uniform from base to margin; the black markings obsolescent or altogether wanting. Secondaries brown (without the red shade); across the disk a belt of same form as in *Chariclea* and *Helena*, a shade only lighter than the ground, and all of one hue (no white as in the allied species); the rounded spots and clusters of scales repeated faintly, and behind each of the latter a pale, undefined patch.

Female.—Same size. Brown, dusky, inclining to melanism, sometimes of a slaty hue rather than brown, and always with a peculiar smooth surface, suggestive of grease which had been removed by benzine; the markings pale, diffuse; the mesial stripe, on primaries, has become a broad band reaching from margin to margin, and the sub-marginal clusters of scales are merged in a continuous stripe; on secondaries, all the markings about base and on disk are obsolescent, the sub-marginal clusters are large and diffuse, and the margin is edged by a crenated band. Under side as in the male.

From one ♂ and two ♀ sent me by Mr. Thomas E. Bean, and taken at Laggan, Alberta. He writes: "This Argynnis, I think, occurs strictly above timber line, and not very near it either, though also not at the highest points of the mountains. In 1888, on one mountain, it was decidedly frequent, but in 1889, I saw not one. The females all present the same slightly shining surface, whether brown or slate in color, but it is not grease. The examples I sent you were not in the least greasy, nor

are any that I have." (This was in direct reply to my question, suggested by Dr. Holland, who was confident they had been greased and cleaned.) "I do not notice this shiny surface especially in the males; they are all fulvous, and none show melanism. All the females tend to obscuration, and more than half are about as melanic as those sent you, one or two perhaps a little darker. Some few are clear enough for the fixed lines to show. This form does not at all frequent the same localities as *Chariclea*, which only occurs below timber, so far as I know."

Alberta is wholly unlike any member of the group known to me. It does not at all agree with *Chariclea*, var. *obscurata* McLachlan.

In the delicacy of its markings the male is nearer *Helena* than *Chariclea*, but these are interrupted and reduced. *Helena* is an alpine species, and found above timber line. But it retains at every elevation which it frequents the same features. The examples under view are larger than any *Helena*, and equal the largest *Chariclea*.

NOTES ON SIGALPHUS CURCULIONIS AND SIGALPHUS CANADENSIS.

BY C. P. GILLETTE, AMES, IOWA.

I reared from *Conotrachelus nenuphar* last summer a number of parasites, which were determined for me by Dr. Riley as *Sigalphus curculionis* Fitch, and *S. curculionis*, var. *rufus*. Full descriptions of both of these may be found on page 27 of Riley's Third Missouri Report, and upon page 67 of the Supplement to the Missouri Reports.

The variety *rufus* appeared much more abundant than *curculionis* in my breeding cages the past summer. These two forms differ so much from one another, and in some respects, especially in the number of joints of the antennæ, from Riley's descriptions, that I have made the following notes upon them :—

Three females of the dark form, bred by myself, and two males loaned me by Prof. Osborn, have the ocelli in every case, not touching, but distinctly separated. The two males have respectively 29 and 30 joints in the antennæ. Two of the females have 29 joints each, and one 28 joints in the antennæ. The largest female measures just .14, and the males

measure a scant .13 of an inch in length. The ovipositor is exserted in one case .11, and in two cases .12 of an inch. Length of wing .14 of an inch; length of antennæ .125 of an inch. The breadth of the head, as compared to *rufus*, is as five to six.

In the eleven specimens of *rufus* now in my collection the ocelli are in every case distinctly separated. In five cases the antennæ are 32-jointed; in four cases they are 31-jointed, and in two cases they are 30-jointed. All are females, and in no case do they vary much from .15 of an inch in length. The shortest measurement of exserted ovipositor is .14, the average is .18, and the longest is .20 of an inch in length. The breadth of the abdomen, as compared to *curculionis*, is in the proportion of four to five. Length of wing .15 of an inch; length of antennæ .15 of an inch. *Rufus* is decidedly more robust and larger in every case than *curculionis*, and, were it not for the fact that so eminent an authority as Dr. Riley considered them the same species, I should think that *rufus* ought to be raised to the rank of a species.

Sigalphus canadensis.—Three specimens of *S. canadensis* were reared by me the past summer from the plum gouger *Anthonomus scutellatus (prunicida).* How this little braconid can deposit her egg within the hard pit of the plum, I am unable to say. It can not be that it is deposited there before the pit becomes hard, for the larva of the gouger does not get entirely through the pit until the latter becomes very hard, and the parasite does not attack the larva of the gouger in time to prevent its complete development and pupation, as was found by cutting into the plums containing parasitized pupæ of *Anthonomus scutellatus.* When the larva of the gouger becomes full grown it gnaws a hole through the pit, out of which it can escape when it has changed to a beetle, and the parasite is dependent upon this provision of the larval gouger for its own escape. Possibly the parasite does not deposit the egg until the opening has been made in the pit; but, if this is the case, it must go through its transformations in a very short time. And how would the female know at what part of the plum to insert her ovipositor to strike the small opening in the pit? Although but three of these parasites were secured, it was not uncommon to find a plum with a small exit, such as is made by the mature parasite in escaping, and which is much too small for the exit of the gouger.

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 104, Volume xxii.)

Genus LEPTARCTIA Stretch.

1873—Stretch, Zygænidæ and Bombycidæ, 118.

Head small, hardly retracted; eyes inconspicuous, bulging; ocelli distinct; vestiture thin, loose and divergent; tongue weak and short, spiral; palpi weak, short, drooping, with thin divergent vestiture; legs sub-equal, posterior slightly the longest; middle and posterior tibiæ each with minute terminal spurs only. The thorax is short, stout, convex with thin hairy vestiture. The antennal joints of the female have the joints marked, scarcely serrate; in the male they are bipectinate. The primaries have 7 to 10 out of a long stalk from the end of the sub-costal, 6 from a short spur out of the same point; 3, 4 and 5 are nearly equi distant from the end of the median, and quite close together. On the secondaries 8 as usual, 6 and 7 from the end of the sub costal; 3, 4 and 5 rather close together from the end of the median. I had intended to give a review of Mr. Butler's work on this genus (1881, Ann. Mag., N. H., ser. 5, VIII., 312), but the excellent paper by Mr. French in the November-December, 1889, numbers of the CAN. ENT. has rendered this unnecessary, and I simply give the bibliography, using Mr. French's sequence of species or varieties. Whether in a genus like this, where no two specimens are alike, so many names are desirable is a question. Twice the number could be as justly applied. A large series of specimens is in the United States National Museum, one lot bred from eggs produced by a ♂ *stretchii* with a ♀ *lena*—the extremes of the series as arranged by Mr. French.

L. stretchii Butler.

1881—Butl., Ann. Mag. N. H., 5, VIII., 312, *Leptarctia.*
1889—French, CAN. ENT., XXI., 222, f. 12, *Leptarctia.*
♂ *dimidiata* Str.
1873—Stretch, Zyg. & Bomb., pl. V., f. 9, *Leptarctia.*
1881—Butler, Ann. Mag. N. H., 5, VIII., 312, *typ. pr.*
Habitat—Oregon, So. California.

L. boisduvalii Butler.
1881—Butler, Ann. Mag. N. H., 5, VIII, 313, *Leptarctia.*
1889—French, Can. Ent., XXI., 222, f. 13, *Leptarctia.*
decia Stretch.
1873—Stretch, Zyg. & Bomb., pl. V., f. 15, *Leptarctia.*
1881—Butler, Ann. Mag. N. H., 5, VIII., 313, *typ. pr.*
Habitat—Oregon.

L. dimidiata Stretch.
1873—Stretch, Zyg. & Bomb., 123, ff. 7-10, *Leptarctia.*
1881—Butler, Ann. Mag. N. H., 5, VIII., 313, restr. to f. 7 and 8.
1889—French, Can. Ent., XXI., 222, f. 14, *Leptarctia.*
Habitat—Calif., Oregon, Colorado.

L. albifascia French.
1889—French, Can. Ent., XXI., 232, f. 15, *Leptarctia.*
Habitat—California.

L. occidentalis French.
1889—French, Can. Ent, XXI., 223, f. 16, *Leptarctia.*
Habitat—Northern California.

L. latifasciata Butler.
1881—Butler, Ann. Mag. N. H., 5, VIII., 313, *Leptarctia.*
1889—French, Can. Ent., XXI., 223, f. 17, *Leptarctia.*
Habitat—Oregon, So. California.

L. fulvofasciata Butler.
1881—Butler, Ann. Mag. N. H., 5, VIII., 313, *Leptarctia.*
1889—French, Can. Ent., XXI., 223, f. 17, *Leptarctia.*
lena Stretch.
1873—Stretch, Zyg. & Bomb., pl. 5, ff. 13-14, *Leptarctia.*
1881—Butler, Ann. Mag. N. H., 5, VIII., 313, *typ. pr.*
Habitat—Oregon, Truckee Calif.

L. californiæ Walker.
1855—Wlk., C. B. Mus. Lep., III., 625, *Nemeophila.*
1873—Stretch, Zyg. & Bomb., 240, = *lena.*
1881—Butler, Papilio, I., 130, *an sp. id. lena.*
1881—Butler, Ann. Mag. N. H., 5, VIII., 312, *Leptarctia.*
1889—French, Can. Ent., XXI., 223, ff. 18-19, *Leptarctia.*

lena Bdv.

1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 73, *Lithosia.*

1873—Stretch, Zyg. & Bomb., pl. V., ff. 11 and 16, *Leptarctia.*

adnata Bdv.

1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 73, *Lithosia.*

1873—Stretch, Zyg. & Bomb., 120, *pr. syn.*

1881—Butler, Ann. Mag. N. H., 5, VIII., 313, *pr. syn.*

Habitat—Calif., Oregon.

L. wrightii French.

1889—French, Can. Ent., XXI., 224, ff. 18-19, *Leptarctia.*

L. decia Bdv.

1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 72, *Lithosia.*

1873—Stretch, Zyg. & Bomb., 121, pl. 5, ff. 1, 2 and 15, *Leptarctia.*

1878—Strecker, Proc. Dav. Ac. Sci., II., 273, *Leptarctia.*

1881—Butl., Ann. Mag. N. H., 5, VIII., 314, *Leptarctia.*

1889—French, Can. Ent., XXI., 224, ff. 20, 21, *Leptarctia.*

Habitat—California, Oregon.

L. lena Bdv.

1869—Bdv., Lep. Cal. (Ann Soc. Ent., Belg., XII), 73, *Lithosia.*

1873—Stretch, Zyg. & Bomb, 120, 240, pl. V., ff. 3–6, 11–14, 16.

1881—Butler, Ann. Mag. N. H., 5, VIII., 314, restr. to ff. 3 and 5.

1889—French, Can. Ent., XXI., 224, f. 22, *Leptarctia.*

Habitat—California, Oregon, Colorado.

This arrangement, giving each of the forms equal value, is of course not to be taken as indicating the specific distinctness of any. The indications are all that there is but a single species with a wide range of variation. It remains only to state that in Mr. French's paper he gives the life history of the species, describing all stages.

Genus Kodiosoma Stretch.

1873—Zyg. & Bomb., 67.

This genus contains a series of forms of doubtful distinctness, none of which I have been enabled to study. The species seem excessively rare, and there are no specimens of the genus in the collection U. S. National Museum.

K. eavesii Stretch.

1873—Stretch, Zyg. & Bomb., 69, pl. II., f. 6, *Kodiosoma.*

Habitat—Nevada.

K. fulva Stretch.

1873—Stretch, Zyg. & Bomb., 67, pl. 2, f. 7, *Kodiosoma.*

Habitat—California.

K. nigra Stretch.

1873—Stretch, Zyg. & Bomb., 68, pl. 2, f. 8, *Kodiosoma.*

Habitat—California.

K. tricolor Stretch.

1873—Stretch, Zyg. & Bomb., 68, pl. 2, f. 5, *Kodiosoma.*

Habitat—California.

Genus Phragmatobia Steph.

1830—Steph., Ill. Brit. Ent. Haust., II., 73.

1855—Wlk., C. B. Mus., Lep. Het., III., 628.

1862—Morris, Synopsis, 346.

Head small, retracted; tongue weak and short, palpi rudimentary. Vestiture woolly. Antennæ simple in both sexes. Legs weak and rather short; tibial spurs distinct and normal in number. The anterior and middle claws seem simple; posterior with a decided tooth at tip. The tarsi are very feebly spinulose.

Primaries with 7 to 10 out of a stalk from the end of subcostal; 7 and 10 from about the same point; 8 and 9 forking just before the apex; 3, 4 and 5 are about equi-distant from the end of the median.

Secondaries veins 6 and 7 together from end of subcostal, 8 from its middle; 3, 4 and 5 from the end of the median rather close together; 4 about twice as far from 3 as from 5.

P. assimilans Wlk.

1855—Wlk., C. B. Mus., Lep. Het., III., 630, *Phragmatobia.*

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 536, *Phragmatobia.*

1862—Morris, Synopsis, Supplt., 346, *Phragmatobia.*

1863—Saund., Syn. Can. Arct., 23, *Phragmatobia.*

1864—Pack., Proc. Ent. Soc., Phil., III., 122, =*rubricosa.*

1889—Slosson, Ent. Amer., V., 85, *an sp. dist. rubricosa.*

Habitat—New Hampshire.

This species—if species it is—has languished among the synonyms, ever since Dr. Packard referred it there in 1864. A specimen taken in 1888 by Mrs. Slosson seems to justify its claim to recognition as a species, and it is so recognized here.

P. rubricosa Harris.

1841—Harris, Rept. Ins. Mass., 253, *Arctia.*
1852—Bdv., Lep. Cal. (Ann. Soc. Ent. Fr.), 49, *Arctia.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 541, =*Crocota rubicundaria.*
1862—Harris, Inj. Ins., 356, f. 171, *Arctia.*
1862—Morris, Synopsis Supplt., 341, *Arctia.*
1863—Saund., Syn. Can. Arct., 24, *Phragmatobia.*
1864—Pack., Proc. Ent. Soc., Phil., III., 122, *Phragmatobia.*
1883—Edw.*, Papilio, III., 127, *Phragmatobia.*
1887—Edw.*, Ent. Amer., III., 168, *Phragmatobia.*

fuliginosa ‡ Auct.

1852—Bdv., Lep. Cal. (Ann. Soc. Ent. Fr.), 40, *Arctia.*
1855—Wlk., C. B. Mus., Lep. Het., III., 628, *Phragmatobia.*
1860—Clem., Proc. Acad. Nat. Sci., Phil., XII., 539, *Phragmatobia.*
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, *pr. syn.*
Habitat—Mass., New York, Maine, California, Canada.

It is not admitted by some of our old collectors that *rubricosa* refers to a form really distinct from the European *fuliginosa.* Superficially they undoubtedly resemble each other very closely; but how nearly they will agree when closely compared is another question.

P. dubia Wlk.

1856—Wlk., C. B. Mus., Lep., Het., III., 682, *Cycnia.*
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 72, *Phragmatobia.*
Habitat—H. B. Terr.

This species has dropped out of our list; but I cannot find that it has been referred as a synonym anywhere. Messrs. Grote and Robinson in their notes (supr. cit.) say: "Wings semitranslucent, brown or mouse color; veins on both wings whitish above; eyes margined narrowly with white; legs shaded with whitish outwardly; abdomen (greasy in the specimen) with three rows of brown spots." There should be no difficulty in identifying this species should it turn up.

(To be continued.)

FOOD PLANT OF MELITÆA TAYLORI, EDW.

Having been asked by Mr. Jas. Fletcher, of Ottawa, to look for the larva of *M. Taylori*, with the purpose of discovering its food plant, &c., it was with much pleasure that I accepted the commission, and now have the gratification to inform you of my success.

I began searching on March 10th, but found everything very backward, owing to the severe winter experienced on this island. Being determined, however, not to miss an opportunity of succeeding, I continued making a close examination of the declivities of the coast at Beacon Hill (thinking it probable that the larvæ had not reached the top of the bluff before hibernating); but after several attempts to locate it, I turned my attention on March 30th to the level land above the cliff, and was rewarded by finding it feeding in numbers on the Rib-wort Plantain *(Plantago lanceolata, L.)*

One peculiar fact I must mention of *M. Taylori* is that the larvæ evidently avoided the old plants, and fed solely on the younger ones, instinctively knowing, perhaps, that they would be less exposed to the attacks of their natural enemies, as the young plants were mostly hidden by the dead grass of last year's growth; however, when the first was found it was an easy matter to follow them up, with the result of capturing about two dozen in half an hour.

They varied considerably in size, some being 6 lines, while most of them were 10 lines in length. I found a cast-off skin showing that they had moulted since "feeding up" this spring; and also that had I looked in the right place a few days sooner I should, without a doubt, have found them. They generally feed singly, but as their food plant grows in large patches it was possible to collect a dozen or more without changing one's position.

They occur all along the coast immediately fronting Beacon Hill, and I have found them a mile away from where they were plentiful; but, in that case, they were very few and far between, although I have collected several dozen during the few hours I could spare from business. They are day feeders, and naturally very slow in their movements.

The following table gives dates of capture with result:—

March 30 took 23 in ½ hour.
" 31 " 37 " 1 "
April 2 " 25 " 1 "

April 6 took 11 in 2 hours.
" 11 & 12—heavy snow storm.
" 14 took 5 in 1 hour.
" 17 " 1 " 1 "

The larvæ are doing well in the breeding cage, and at some future time I shall be glad to submit my observations as to habits while in captivity. Meanwhile am pleased to contribute the above facts.

W. H. Danby, 57 Government Street, Victoria, B. C.

ARGIOPE RIPARIA AND ITS PARASITE ICHNEUMON ARANEARUM, AND ITS PARASITE A CHALCID FLY.

BY FREDERICK CLARKSON, NEW YORK.

The nests of *Argiope riparia* were unusually abundant last autumn in the neighborhood of this city. During the preceding summer this gayly colored, but atrocious looking spider, could be seen stationed in the centre of its well formed geometric web on nearly all of the low shrubbery in the uncultivated portion of Central Park. Merciless to every insect caught in her web, her household is nevertheless oftentimes greatly reduced, if not altogether destroyed by *Ichneumon aranearum*, a fearless and victorious enemy. Among a large number of nests collected last autumn, those obtained in the latter part of September and as late as the 10th of October contained ova: a single cocoon possessing by actual count 1,277 eggs; those found later in October, and as late as November 3rd, contained young spiders. Only a few of those collected in October had suffered parasitic attack, but the greater number of such as were gathered later in the autumn, contained the larvæ of *Ichneumon aranearum* feeding upon the spiders, or else spun up in their cocoons sometimes to the number of forty. May we not infer from these facts that the parasite deposits her eggs in the nest of Argiope after the eggs of the latter have hatched, or at least, whatever may be the time of deposition, the larva of the parasite feeds upon the spiders?

In examining the cocoons of this Ichneumon an interesting exhibit of secondary parasitism was revealed. In several of the nests of Argiope containing each some thirty cocoons of the Ichneumon, I found that each larval inhabitant was being devoured by from eight to ten larvæ of a Chalcid fly.

"Great fleas and little fleas have smaller fleas to bite 'em,
The smaller fleas have lesser fleas, so on ad infinitum."

CASES OF LONG PUPAL PERIODS AMONG LEPIDOPTERA.

BY R. R. ROWLEY, CURRYVILLE, MO.

In May, 1888, I received from Mr. W. H. Edwards, of Coalburgh, two larvæ of *Anthocharis genutia* which were feeding on pepper grass. On the 22nd (May), both larvæ pupated, having suspended two days before.

As the imagoes did not appear in a reasonable length of time, I communicated the fact to Mr. Edwards, and he informed me they would remain chrysalids till the next May. The summer of 1889 came and went and still my little *Genutia* pupæ slept on and entered upon the second year of their fast. I then learned of the tendency in the genus *Anthocharis* to remain two years in the chrysalis state.

The pupæ were kept through the past two winters in a closet adjoining a warm room, and the first imago, a beautiful male, appeared March 7th, 1890, the other, a female, five days later (12th), after a pupal period of nearly twenty-two months.

In a recent letter from Mr. Edwards, I was informed that the Californian species of *Anthocharis* often remain two years as chrysalids, but he does not state that he has ever known a *Genutia* pupa to go so long.

Another case.—On the 13th of February, 1888, I received four cocoons of *Callosamia angulifera* from Miss E. L. Morton, of Newburgh, N. Y. These cocoons were spun in the mid-summer of 1887. Three of them produced imagoes the following May, but the fourth remained over till the 19th of the next April (1889), having passed twenty-one or twenty-two months in the pupal state. I have had pupæ of *Triptogon modesta*, *Philampelus pandorus*, *Citheronia regalis* and *Eacles imperialis* to fail to give imagoes in the spring, living through the summer, and lingering even till early autumn before death overtook them, but never knew one to survive till the second summer.

NOTES.

A Rare Butterfly.—We learn from the Ottawa Naturalist that five specimens of *Erebia discoidalis* Kirby, one of the rarest in the Canadian fauna, were taken by Mr. John D. Evans, at Sudbury, Ontario, on the 12th May last. The perfect insect is figured and described in Edwards "Butterflies of North America," 3rd Series, Part VII.

TWO INTERESTING MONSTROSITIES.

BY W. HAGUE HARRINGTON, OTTAWA.

Many minor malformations of wings, elytra, etc., have been observed in examining insects, but recently I have met with two monstrosities which seem worthy of record. The first insect is a ♀ *Fœnus tarsitorius* Say., given to me by my friend, Mr. Guignard, and captured by him on 24th June, 1885. In this specimen the left posterior tibia becomes trifid about one-fourth of its length from the base, the side branches diverging at an angle of about 30°. The three portions are symmetrical, of nearly equal size (but slightly smaller than the tibia of the opposite leg), and bearing the terminal spurs, etc. The three tarsi issuing from them are perfect in every particular of size and colour. The femur is swollen and gives an impression of three agglutinated, while the trochanter and coxa are also enlarged.

The second specimen was noticed a few days ago while I was putting sex labels on some Carabidæ, and is a ♀ *Pterostichus lucublandus* Say. In this insect only the last joint of the left middle tarsus is in triplicate, and while the parts are equal in size to one another, they are individually under the normal size. The fourth joint is widened (like three small ones joined laterally), while the remaining articles are somewhat shortened and thickened. The tibia is also slightly modified ; the spines being irregular, and one of the terminal spurs flattened and bifid.

CORRESPONDENCE.

HEPIALUS QUADRIGUTTATUS.

Dear Sir: In a letter to me, dated October 7, 1864, the late Mr. Francis Walker wrote as follows: "Your *quadriguttatus* is, as you suppose, identical with my *H. argenteomaculatus* var." I have myself no doubt that these two Hepiali are distinct species. In Agassiz's Lake Superior, Harris gives *quadriguttatus* as the same as the eastern *argenteomaculatus*, which latter Mr. Mead took in the Catskills, N. Y.

A. R. GROTE, Bremen, Germany.

Mailed June 4th.

The Canadian Entomologist.

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APHIDIUS GRANARIAPHIS, N. SP.

BY PROF. A. J. COOK, AGRICULTURAL COLLEGE, MICHIGAN.

Black above, yellowish brown beneath. The antennæ are black, the front, mouth parts and legs yellowish brown. Rarely the femora and tarsi are dusky, and the ventral surface quite dark. Very rarely the dorsal surface is brownish, except the pedicel and tip. The occiput or collar is brown. The antennæ are sixteen jointed in the female, and seventeen in the male, and are cylindrical, recurved, and thickly set with short, light colored hairs. The first two joints are shorter and larger than the others; the succeeding joints are cylindrical, close together, and equal in length, except the last, which is longer and conical. The abdomen is lanceolate, and all the segments are freely moveable on each other, so it can be easily bent under the thorax. The venation of the wings—see figure—is simple, and the first discoidal cell incomplete. We know from the simple venation of the wings that this is a Braconid. It belongs to the genus Aphidius, as the first discoidal cell is incomplete, the abdomen lanceolate, the antennæ sixteen or seventeen-jointed, and the ventral valves in the female simple. It is 2½ mm. (1-10 in.) long.

Fig. 3.

This species differs from *Aphidius avenaphis* Fitch, as that species has nineteen or twenty joints to the antennæ, is honey yellow where this is brown, and the first two joints of the antennæ, the pedicel of the abdomen, and a spot on the suture between the first and second joints of the abdomen are honey yellow and not black as in Granariaphis. The joints of the antennæ are also less pedicelated, or closer together than in the Avenaphis.

This species is interesting from the fact that it was the principal agent in exterminating the countless millions of grain Aphides last season—1889—in Michigan and adjacent States. While Aphidius avenaphis and other enemies, like Syrphus flies, Coccinnelids and Chrysopa fly larvæ were

numerous and very active. Yet, by far the greater part of the louse destruction here was accomplished by this new species—Aphidius granariaphis. June 30th.—The heads of wheat were thronged with healthy vigorous lice, with but few of the light colored rounded parasitized lice—see figures. Ten days later the lice were nearly gone, and the parasitized ones were largely in the majority. Rapidly as the lice increase, they seem to be no match in this respect for the parasites.

Fig. 4.

Fig. 5.

I think the grain lice Aphis (Siphonaphora) avenæ destroyed at least one-third of the wheat crop of Michigan last year, and greatly injured the balance of the crop. Had it not been for these parasites we should have had, I think, no crop at all.

THE BUTTERFLIES OF LAGGAN, N. W. T.; ACCOUNT OF CERTAIN SPECIES INHABITING THE ROCKY MOUNTAINS IN LATITUDE 51° 25′.

BY THOMAS E. BEAN, LAGGAN, ALBERTA.

(Continued from page 99.)

DEFINITE MARKS OF THE ♀.—Observation of 62 caught specimens enables me to supplement, in some degree, Mr. Strecker's description. The smallest measures 46 mm., equal to 1.8 inch. The largest is 58.5 mm., or 2.3 inches. The average expanse of the 62 is 52.5 mm., or 2.07 inches. The cell spot above primary is larger than in the males, and has never that semi-obsolete appearance which it presents in some of the males; it varies from a small but definite spot of .5 mm. in diameter to a spot of 1.5 mm., is usually sub-rotund, sometimes sub-linear, and is frequently centered with yellow in moderate degree. On under side hind wing the dark nucleus or "patch" of costa is lacking in all, and the submarginal series of dark spots beneath both wings is found to be plainly presented only in three specimens, with slight traces in fifteen others. *Elis* ♀ varies greatly as to condition of border above primary; a few of my specimens have a completed dark border, much as in an average *Hecla*, with the yellow spots small and entirely enclosed. These, however, are extreme instances. At the opposite extreme are specimens

with only the outer side of the border formed, the inner side lacking, but with the row of yellow spots tolerably conspicuous in contrast to the orange ground of the disk. Between these two extremes occur numerous intermediate degrees. The most qualitative distinction of the fore-wing border is that the yellow spots are in general nearly of equal size in the same individual, and especially that the spot at anterior median interspace is usually almost as large as the others ; this is the spot which in most forms of *Colias* is usually much smaller than the adjoining spots, and which tends to become obsolete in proportion as the border is more completely developed.

The special type of ♀ Mr. Strecker drew his description from, with seven yellow spots in fore-wing border, is not the more common variation. Usually the two spots near apex are obsolete ; an occasional specimen, however, with all the seven spots neatly defined, attests the accuracy of the printed description.

Mr. Strecker also describes an "Albinous ♀ form" of *Elis*, stating that about six of the albinous and nine of the orange form were taken by Capt. Geddes. This proportion of six albino to nine orange, indicates that the "albinous ♀" was based on an error of identification. In the course of several summers' collecting, and also in breeding *Elis* pretty freely from the egg, nothing resembling an albino has been found, while I have seen *ninety* orange ♀s. The ♀ of another species must have been mistaken by Mr. Strecker for a white form of *Elis*. In the district occupied by *Elis* occurs a *colias* rather less frequent, the ♀ usually nearly white, but with a variety still more rare which is a bright clear yellow. It seems likely this white *Colias*, about size of a small *Elis*, may have been the original of the supposed "white *Elis*." The status of this form is somewhat in doubt. It is near to *Pelidne* and *Scudderi*, as its ♂ sufficiently demonstrates, and of course not specially close to *Elis;* its ♀, however, has some resemblance to *Elis* ♀.

One important character of *Elis* remains to be mentioned, which is, that the ♂ is characterized by the presence of the so-called "glandular space" on upper surface of hind wing on costa near base of wing. This structure appears, under moderate enlargement, as a dense cluster of much tilted scales of special form. Its function (if it has one) is probably mechanical rather than physiological. So far as the *Colias* forms are concerned, it is found especially, if not exclusively, in the higher forms, and

wanting in the more primitive, being apparently a modern improvement adapted to some purpose of mechanical utility and developed only at an advanced stage of Coliad progress. Perchance 'tis a refinement in the mechanism of flight, or mayhap some new sort of musical implement, dispensing ultimate atoms of harmony inaccessible to our coarse sense as the "music of the spheres." Of the North American forms of *Colias* only three beside *Elis* are possessed of this peculiar apparatus. These are *Meadii*, *Cæsonia* and *Eurydice*, and the possession of this character brings them into very good society indeed, comprising such fine species as *Lesbia*, *Aurora*, *Vautieri*, *Fieldii* and *Electra*, in all of which I have examined this structure, as also in *Edusa* and *Myrmidone*. In *Elis* it appears in all the males I have obtained, whether bred or caught. This "glandular space" is not peculiar to *Colias*. I have noticed it in several species of *Catopsilia*, among them *Rurina*, *Trite* and *Pyranthe*. In *Gonopteryx clorinde* ♂ the structure is well developed, being in the specimen I examined 17 mm. long, and 2 mm. broad in the middle; the colour pale brown. In *Colias elis* the "glandular space" varies from a pale—slightly greenish—yellow to a bright orange.

The foregoing parts of this description, relating to the size and proportions of the butterfly, the breadth of the dark borders, and the size of the several spots and marks on the wings, have been taken from captured butterflies, because bred specimens seldom present the natural averages, but instead exhibit differentiations constituting either type retardation or race progress resulting from and proportioned to the conditions under which they are reared; conditions usually diverse from those of nature. It will not be necessary to adhere to this discrimination in describing the colors and the minute details, and these can more profitably be derived from observation of the bred specimens, where they are displayed in a perfection almost impossible to find intact in flown specimens.

The material of *Elis* bred during three seasons, 1887 to 1889 inclusive, consists of three families *ex ovo*, and four butterflies matured from larvæ found wild—altogether 37 ♂ and 28♀, not to mention a lot of parasites from one of the estray larvæ. These bred specimens mostly show a departure from the average type developed under ordinary out-of-doors conditions. In general this diversion is a progress, an advance of type, a presentation of the ideal instead of the practical *Elis*. In natural conditions *Elis* is subject to somewhat severe limitations. The caterpillar

issues from the egg early in August in average seasons, and its term of hibernation, beginning soon after the middle of August, continues until approximately the beginning of May, so that ordinarily hibernation lasts somewhat more than eight months. Emerging from its winter shelter early in May, the juvenile larva re-enters active life, still a literal infant though over eight months old*.

So chilly are the May nights, and many of its days also, that more than half this active period of the larva must be passed in a state scarcely different from actual hybernation. The conditions of life are doubtless somewhat restrictive, and a removal of these disabilities, by rearing the caterpillars in a warm house, is like an introduction into the tropics.

The result of this culture in an improved climate, other circumstances being favorable, is a notable progress of type, an outcome of butterflies definitely in advance of the ordinary averages.

One of the bred families illustrates well this immediate improvement of type. This lot comprises nine ♂s and ten ♀s, and is a natural family from eggs of one ♀. The increased size of these specimens, as compared with the caught lot, is decisive. The twenty-nine caught ♂s average 51 1-5 mm.; the nine ♂s of this family show an average expanse of 53⅔ mm. Only one of the ♂s of this family expands less than the average of the caught ♂s, each of the remaining eight exceeding that average. The ten ♀s average 57½ mm., against 52½ mm., as the average measure of the 62 caught ♀s; indeed, each of the ten ♀s of this brood is decidedly beyond the average of the caught ♀s, none being under 55½ mm. One of the ♀s, measuring sixty mm., is slightly over 2.36 inches, is the largest *Elis* in my series. These nineteen specimens are as much superior to the caught material, in average of pattern elaboration, as in size. At a first general view they might almost suggest the idea of a distinct species, so superior are they as a body to the general mass of the caught set. But the difference would become intelligible to any careful observer, on inspection, as a simple advance of one set beyond the average development of the other; a difference in degree, not a change in method. This distinction between quantitative and qualitative differences is the vital point in

* I hope none of my younger readers entertain the absurd mediæval superstition that hibernating caterpillars pass the winter in a *frozen condition*. In successful hibernation they do not get near to such a condition; but if they do absolutely freeze, then are they undone caterpillars. Valkyria gives them sleep, unmixed with dreams, and they wake in Valhalla.

estimating the status of closely related forms. With fully representative material of any two forms to compare, the pattern on the wings tells the story, if the observer can read in the butterfly alphabet. The errors of interpretation come chiefly from the primary fault of mistaking a contrast between less and more for a diversity of like from unlike, or the reverse. In frequent comparisons of *Elis* and *Meadii*, my chief effort has been to ascertain the nature of the difference between them, and my resulting impression is that *Elis* is a valid species, near as it is to *Meadii*. I do not find an overlap of closely similar specimens uniting them, and the two forms appear to have a somewhat diverse plan of pattern, a somewhat dissimilar method of variation, indicating that they are travelling different roads. They are, I take it, already a little different in kind, not merely in degree. In comparing the nineteen *Elis* of the family above mentioned, with the set of caught *Elis*, however, the difference is one which need not be misread, even were the circumstances of origin unknown. It is a difference large in amount, but not signifying alienation. The overlap between the two series consists chiefly of a small proportion of males ; several of the most finely developed of the caught set being about of the same rank as several of the least developed males in the bred family. Among all the caught females only one compares in size and fine development with the average of the ten females of this family. Evidently, in this signal advance in race character, the females showed more tendency to depart from type than the males. All the females in this family except one, and more than half the males, far surpass the average of caught set as to breadth of dark borders, and it is a genuine progress, entirely free from that erratic over-development of dark markings often occurring in bred specimens ; in these specimens the effect is completely harmonious and symmetrical. In this family there are two colors, both of males and females. Four of the males are yellow-orange, the other five bright red-orange, one of them very fiery orange. Eight females are of the red shade, several being almost of as intense a shade as the most brilliant male ; the remaining two are yellow, not so clear and light as the yellow-orange males, but slightly tinged with ochre. The reddest males and females are unlike any *Meadii* in my collection ; clearer red than any, and lacking the burned-brick tinge of one very red female *Meadii*. Only two, both females, of the caught *Elis*, are quite of this pure red-orange hue. The caught *Elis* do not specially differ from *Meadii* in the color of disk above primary, and are in general somewhat tinged with ochre ; one female is

unique in color, being greenish-yellow, but is not otherwise variant from usual form.

Another family consisting of twenty-five ♂s and thirteen ♀s, from eggs laid by one female, scarcely, if at all, surpasses the averages of the caught material as to expanse. The twenty-five ♂s show an average of only 50½ mm., while the caught males average 51 1-5 mm. The thirteen ♀s average slightly larger than the caught females, 53 mm. against 52½ mm. As to pattern, the females present a rather more perfected type than the out-door average, but the males are scarcely equal to the natural average.

The relation found in these two bred families between the numerical proportion of the sexes and the degree of type development, lends some support to the hypothesis that favorable conditions during larval growth tend to a greater production of females, while less favorable conditions produce an increased outcome of males. The proportion of males to females in these two broods is in great contrast. The brood which shows such improved averages contains slightly more than an even share of females; and the family averaging scarcely up to nature's mean level contains a large overplus of males.

Additional to the direct evidence derived from inspection of the butterfly, there are several circumstances which add somewhat to the probability that *Elis* is a good species. Of some little weight, perhaps, is the argument from geographical distribution, that so far as known there is a great gap of country between the district of the form *Elis*, and the territory in which dwells *Meadii* proper. Should later discovery be made of *Elis* considerably further south, or of *Meadii* much more to the north than at present known, the probability of their distinctness would be somewhat lessened. Another and better argument is the inference from relative altitude. *Meadii* is normally an alpine butterfly, *Elis* is subalpine. All accounts agree that *Meadii* lives above timber, though like other alpine habitants, it may in peculiar circumstances make excursions to a lower level. Just such an incident may have originated *Elis*. One needs not an india-rubber imagination to suppose that somewhere in its mountain line of territory, under specially favoring conditions, *Meadii* may have established a colony below timber line. That accomplished, and the feeble colony proving able to maintain itself in the changed conditions, all the elements of the case would combine to speedily separate the new from the old, in kind. Perhaps hardly in any other way could

a distinct species be so rapidly evolved. The ties between the old and the new forms would either be immediately and permanently sundered, or at least greatly enfeebled, as the only means by which these ties of consanguinity could be preserved would be in recurrence of such unusual incursions as that by which the colony had at first been established. The direct influence of the new conditions would be especially effective in producing modification, because the change of conditions would be an unusually great one. However, this is but conjecture. As facts, we know that *Meadii* lives above timber, and *Elis*, at a great distance to the north, below timber; and that they differ, although not broadly. They are not known to live next door to each other, anywhere. The geographical relations of *Elis* to *Meadii* may prove more interesting and important than the question as to the exact biological ties. Should the name of *Elis* prove to be "Dennis," it is but one more skeleton to stand upon end with the rest of the weird monuments up on Synonym Mountain; but, in either event, one would like to know just why *Elis* and *Meadii* live at different relative altitudes.

The nature of the difference in the imago between *Elis* and *Meadii* is the chief reason for considering them distinct. At first sight, I did not expect *Elis* would prove distinct from *Meadii*. After obtaining gradually an ample material of *Elis*, and becoming quite familiar with its mode of variation, such differences between *Elis* and *Meadii* became evident, that I was obliged to consider the two forms as probably distinct. By the kindness of Mr. David Bruce, I have lately obtained an additional fine series of *Meadii*, and after repeated comparisons find my previous impression strengthened. I suppose that a new species of butterfly may be considered inaugurated, so soon as a varying form has acquired a visible diversity in the method of its biological progress, as compared with the method of the proximate species; and that our earliest recognition of this acquired diversity will be by observation of a correlant diversity in the method of the color-pattern of a representative series of the new species, as compared with the method of the proximate species. I think *Elis* has reached this point and that it is a valid species.

Meadii, as such, does not occur at Laggan. My set of six male and eleven female *Meadii* compare with the caught *Elis*, in average size, as follows: *Meadii*, males 47¾ mm., females 48 5-7 mm.; caught *Elis*, males 51 1-5 mm., females 52½ mm.; "fair count and no favour."

· ERRATUM.—Page 96, lines 1 and 2, "Mount Temple about eight miles south-west"—for "south-west" read "south-east."

SOME NEW MOTHS.

BY G. H. FRENCH, CARBONDALE, ILL.

Crocota Rosa, nov. spec.

Expanse .80 of an inch.

Upper surface of fore wings, thorax, collar, upper and front of head and terminal joint of palpi pale yellow-brown or fawn color, the only trace of a discal dot is a little duskiness at the end of the cell. Hind wings red, pale, a little dusky, somewhat rosy tinted. Abdomen concolorous with the hind wings; fringes concolorous with the wings.

Beneath, hind wings concolorous with the upper surface; fore wings more red, uniformly so except that the costa is ochre; legs dusky; abdomen as above, without marks of any kind; under side of palpi yellowish red; eyes black.

One example from Texas and one from Ohio.

This species is close to *Rubicundaria* but lacks the black terminal border to the hind wings and the black marks on the abdomen. Besides this the fore wings are a little narrower.

Hemaris Brucei, nov. spec.

Expanse 1.55 inches.

Top of head, thorax and basal two joints of abdomen, olive, not very dark, the shoulder tufts yellowish, only a little lighter than the adjacent parts; the third joint black, with the lateral hairs bright pale yellow, the lateral tufts of one and two the same color, and a faint line of the same on the posterior margin of these joints for a short distance above the tufts; joints 4, 5 and 6 bright pale yellow, the last one slightly rusty, the lateral tufts the same; the terminal joint with its tufts, both lateral and central, jet black. Palpi beneath very pale yellow, almost white, above blackish, only a few black hairs laterally; eyes with a circle of white hairs; body beneath black but sparsely covered with yellow hairs, except the terminal joint where the hairs are black. Wings as in the Senta group, the terminal and costal borders dark brown, narrow, somewhat dentate on the inner edge, the most so near posterior angle; the outer two-thirds of the basal patch dark red, a small red apical patch that does not reach the apex, a few olive hairs at the base. Hind wings with the margins dark brown, the inner one sparsely overlaid with olive, a red anal patch. Under side of fore wings with the borders about the same shade as above, the basal portion overlaid with pale yellow, the same scattered well over the costa,

a mere trace of the red on the basal patch, the apical red patch as above. Hind wings with the basal-internal patch overlaid with pale yellow the same as the fore wings, two red stains, one at the anal angle and the other toward the base, the outer border with a slight red tinge, but no more so than above. Antennæ black.

One male from Colorado, collected by David Bruce, and dedicated to him in the name.

Platycerura Gigantea, nov. spec.

Expanse of wings 2.25 inches.

Head, thorax and abdomen rather dark gray, much darker than its ally *Furcilla*, the head and collar with a mixture of brown scales, the abdomen also mixed with brown, except the lateral semi-tufts and the terminal joint. The fore wings with a basal half line and three transverse lines as in *Furcilla*, the second representing the transverse shade of the Noctuidæ, all black; the t. a. line is not quite so much angled on median vein as on *Furcilla*, the line broader; the shade line or second a little more wavy, curving outward on median vein and outward again on submedian, not touching the t. p. line but more separated from it than in *Furcilla;* reniform a black slightly curved mark, shaded a little outwardly; t. p. line takes the same course as in its ally, but not bent inward quite so much below the cell, bordered externally with a very slight pale shade; s. t. line a very faint pale shade taking the same course as in *Furcilla*, and scarcely noticeable only for the slight internal shading of darker gray, this shading more prominent in its anterior third. The wing is almost a uniform gray, except the black transverse lines. Hind wings sordid white, the veins and the internal margin smoky, the costal margin sprinkled with dark scales. Fringes gray, checkered at the end of the veins, the fore wings only faintly so. Under side pale gray, the transverse lines of the fore wings subobsolete, only distinct as black spots on the costa, but the t. a. line and the shading in connection with the s. t. line crossing the wing; hind wings with two black shades extending backward from the costa and a discal spot, the latter showing faintly above. Body below concolorous with the wings. The palpi are short like those of *Furcilla*, the terminal joint blackish; the antennæ with the shaft gray above, the pectinations and all parts below ochre.

One male from Colorado, received from David Bruce. He writes me that he took a half-dozen examples at light. In size this is more nearly

that of a female that I have from Texas that I have called *Furcilla*, but which may possibly be the female of this species. This example expands a little over two inches, the fore wings are a little lighter than the one from Colorado described above, and the t. p. line and the median shade line are united. The hind wings of the Texas specimens are darker than the Colorado, and the fringe of the hind wings is white.

ON THE LISTS OF COLEOPTERA PUBLISHED BY THE GEOLOGICAL SURVEY OF CANADA, 1842–1888.

BY W. HAGUE HARRINGTON, OTTAWA.

During nearly fifty years the Geological Survey of Canada has been engaged in exploration, and since Confederation it has had practically an unlimited field for its operations. The investigation of the fauna and flora of the Dominion, and the formation of a museum of natural history, are included in the plan of its present organization, but its equipment has hitherto permitted but a partial accomplishment of these departments of its work. Geological investigations and collections have largely absorbed the members of the staff, and systematic work outside of these has been chiefly in ethnology, botany and ornithology. In the museum, entomology is as yet represented but poorly, the only order in which there is a creditable collection being the Lepidoptera, of which the diurnals are well shown by the collection purchased from Capt. Geddes. Any collections made by the officers of the Survey have been in addition to their daily duties, and have been, in consequence, neither very numerous or extensive.

The lists of Coleoptera, which are thinly scattered through the Reports of Progress, have, however, a considerable value as having been made in many instances in remote districts, and before the influx of settlers; thereby giving mostly species indigenous to the various localities, and offering good records for the study of distribution. The fact, also, that all but three short recent lists were furnished by LeConte, renders the determinations of additional value and interest.

As the publications of the Survey are inaccessible to very many entomologists, and as their cost, even when obtainable, prevents their purchase merely for the few entomological lists they contain, it is thought that a reproduction in the CANADIAN ENTOMOLOGIST will be appreciated by its readers.

The lists of LeConte's determinations have been collated so as to present a complete catalogue of the species and show the localities where each occurred. The omission of the names of describers (except in lists A. O., L'O., St. L. and N. C.), and occasional clerical or typographical errors have made the identification of some species difficult, and in a few instances so doubtful that they have been allowed to remain as in the original, and will appear in italics in the catalogue. The list of the British Columbia species was especially puzzling in this respect.

The catalogue, collated from the twenty lists which follow, contains 900 references to 469 species (including about a dozen varieties or races), which belong to 216 genera of 40 families. Of these references 300, or exactly one-third, are to 137 species of *Cicindelidæ* and *Carabidæ*, while many of the other species in the catalogue are such as one might expect to be found by collectors whose attention would be largely directed to the ground. The following are the lists which have been collated :—

Report of Progress, 1858, pp. 233–237 and 247–249.

A.O.—Catalogue of Coleoptera, collected by Mr. D'Urban, in the Counties of Argenteuil and Ottawa, in 1858, (99 species named, and following not determined *Gyrinus*, *Dineutes*, *Homalota*, *Tachyporus*, *Philonthus*, *Stenus*, *Epurœa*, *Cis*, *Cistela*, *Nyctobates*, *Apion*, *Tomicus*),

L'O.—List of Coleoptera from L'Original and Grenville, collected by Mr. R. Bell, (34 species).

St. L.—List of Coleoptera, collected by Mr. R. Bell, on the south-east side of the St. Lawrence, from Quebec to Gaspé, and in the Counties of Rimouski, Gaspé and Bonaventure, (69 species, besides *Brachinus*, *Aphodius*, *Tomicus* and *Galeruca*).

Report of Progress, 1875–76, pp. 107–109.

B.C.—List of Coleoptera, collected during the expedition of Mr. Selwyn to British Columbia in 1875, (146 species, besides *Elaphrus*, "probably n. sp., unless described from *Siberia*," *Hydnobius*, *Boletobius*, *Philonthus*, *Melöe*, *Sitones* and undetermined genera). Collection placed in museum of the Natural History Society of Montreal.

Report of Progress, 1878–79, pp. 65, 66c.

N. C.—List of Coleoptera collected by Dr. R. Bell, in 1879, on the Nelson and Churchill Rivers, (37 species and *Gyrinus*).

Report of Progress, 1879–80, pp. 70, 74c.

List of Coleoptera collected in 1880 in Manitoba, and between Lake Winnipeg and Hudson's Bay, (by Dr. R. Bell, in four localities).

Y. F.—York Factory, Hudson's Bay, August and September, (24 species, also *Amara*, *Hydroporus*, "near *Schönherri* of Europe," and *Graphoderes* "to be described by Dr. Sharp").

N. O.—Norway House to Oxford House, July, (39 species, *Anisotoma* and *Graptodera*).

W.—Lower Fort Garry, Manitoba, June and July, (38 species).

C. L.—Cross Lake, Nelson River, July, (35 species and *Amara*).

Report of Progress, 1880–81–82, pp. 29, 39c.

List of Coleoptera collected in 1881 by Dr. Bell and others in the Lake Superior district, and in the Northwest Territories, east of 112th meridian and south of the 60th parallel.

The species given in Lists I. to VII. were collected by Dr. Bell; those in VIII. by Mr. William Isbister, and those in IX.–XI. by Mr. A. S. Cochrane.

S. M.—I. Sault Ste. Marie, between Lakes Huron and Superior, Lat. 46° 31′, Long. 84° 20′, (96 species).

M.—II. Mouth of Michipicoten River, Lake Superior, Lat. 47° 56′, Long. 84° 51′, (9 species).

H. M.—III. Head Waters of the Michipicoten River, Lake Superior, Lat. 48° 30′, Long. 84° 00′, to Lat. 48° 30′, Long. 84° 10′, (28 species).

M. F.—IV. From Missinaibi House, north-east of Lake Superior to Flying Post, Lat. 48° 29′, Long. 83° 35′, to Lat. 48° 02′, Long. 82° 20′, (18 species and two *Graptodera*).

O. K.—V. Oba and Kabinakagami Lakes and Rivers, north-east of Lake Superior, Lat. 48° 30′, Long. 84° 27′, to Lat. 49° 45′, Long. 83° 45′, (43 species).

T. L.—VI. From Thunder Bay to Lake-of-the-Woods, west of Lake Superior, Lat. 48° 25′, Long. 89° 10′, to Lat. 49° 25′, Long. 95° 00′, (23 species).

O.—VII. Oxford House, between Lake Winnipeg and Hudson's Bay, Lat. 54° 53′, Long. 95° 44′, (67 species and *Cryptophagus* and *Graptodera*).

N.—VIII. Nelson River House, near Churchill River, Lat. 55° 50′, Long. 99° 30′, (51 species).

C. C.—IX. From Cross Lake, on the Nelson River, to Cumberland House, on the Saskatchewan, Lat. 54° 40′, Long. 98° 00′, to Lat. 54° 00′, Long. 102° 22′, (19 species).

C. R.—X. From Cumberland House to Reindeer Lake, Lat. 54° 00′, Long. 102° 22′, to Lat. 58° 30′, Long. 101° 00′, (19 species).

R. A.—XI. From the north end of Reindeer Lake to the west end of Athabasca Lake, Lat. 58° 30′, Long. 101° 00′, to Lat. 58° 30′, Long. 101° 00′, (Long. 111° 00′ ? 8 species).

Catalogue of the Coleoptera determined for the Geological Survey of Canada by Dr. J. L. LeConte :—

CICINDELIDÆ.

Cicindela longilabris *Say*. A.O., St. L., B.C., S.M., M.
purpurea *Oliv*. S.M., T.L.
var. 10-notata *Say*. B.C.
vulgaris *Say*. A.O., St. L., S.M., H.M.
repanda *Dej*. [baltimorensis *Hbst*.]. A.O., St. L.
var. 12-guttata *Dej*. St. L., B.C., S.M., H.M.

CARABIDÆ.

Trachypachys inermis *Mots*. B.C.
Cychrus nitidicollis *Chev*., *var*. Brevoorti *Lec*. A.O., St. L.
Carabus Mæander *Fisch*., [palustris *Fisch*.] [Lapilayi *Lec*.]. St. L., N.O., C.L., O., N., C.C.
Chamissonis *Fisch*. Y.F., O., N.
tædatus *Fab*. B.C., N.C., Y.F., O., N.
race Agassii *Lec*. W., C.R., R.A.
serratus *Say*. St. L., B.C., C.L.

Calosoma calidum *Fab.* St. L., M.
tepidum *Lec.* B.C.

Elaphrus Clairvillei *Kirby.* B.C.
riparius *Linn.* St. L., O.
race californicus *Mann.* B.C.

Opisthius Richardsoni *Kirby.* B.C.

Notiophilus sibiricus *Mots.* [punctatus *Lec.*]. A.O., C.C.
Hardyi *Putz.* N.O., C.L., O.

Nebria Sahlbergi *Fisch.* B.C., N.C., N.
Mannerheimii *Fisch.* B.C.

Pelophila rudis *Lec.* O.K., N.
Ulkei *Horn.* N.

Nomius pygmæus *Dej.* H.M., O.K.

Bembidium punctatostriatum *Say.* A.O.
carinula *Chd.* [impressum *Fab.*]. A.O., O.K., O.
littorale *Oliv.* [paludosum *Sturm*]. B.C.
erasum *Lec.* [Mannerheimii *Lec.*]. B.C.
dilatatum *Lec.* St. L.
concolor *Kirby* [salebratum *Lec.*]. W.
quadrulum *Lec.* B.C.
planatum *Lec.* B.C.
complanulum *Mann.* B.C.
funereum *Lec.* B.C.
bimaculatum *Kirby.* N.O., C.L., O.
lucidum *Lec.* A.O., St. L., B.C., Y.F.
picipes *Kirby.* T.L.
Grapei *Gyll.* [nitens *Lec.*]. C.L., O.
incrematum *Lec.* B.C.
patruele *Dej.* A.O., B.C.
nigripes *Kirby.* B.C., O.
versicolor *Lec.* B.C.
sulcatum *Lec.* B.C.
connivens *Lec.* B.C.
mutatum *G.* & *H.* [axillare *Lec.*]. B.C., O.
quadrimaculatum *Linn.* C.C.

Patrobus longicornis *Say*. A.O., St. L., S.M.
septentrionis *Dej.* [hyberboreus *Dej.*]. O.K.
rugicollis *Rand.* St. L.
aterrimus *Dej.* B.C.

Pterostichus honestus *Say* [fastidatus *Dej.*]. A.O.
coracinus *Newm.* [adjunctus *Lec.*]. L'O., St. L., H.M., M.F., O.K.
punctatissimus *Rand.* Y.F., N.O., O.K., O.
lucublandus *Say* (Pæcilus). A.O., St. L., W., S.M., T.L.
caudicalis *Say*. A.O., St. L., W.
corvinus *Dej.* St. L.
scrutator *Lec.* (Lophoglossus). A.O.
orinomum *Leach*. A.O., St. L., B.C., N.C., Y.F., N.O., W., C. L., S.M., H.M., M.F., O.K., O., N., C.C., C.R.
Luczotii *Dej.* ("var. præc?"). A.O., St. L.
erythropus *Dej.* L'O., St. L, S.M.
patruelis *Dej.* A.O., St. L., T.L.
empetricola *Dej.* N.C.
mandibularis *Kirby*. St. L., C.L., O.

Amara avida *Say*. W.
similis *Kirby* [hæmatopus *Dej.*]. N.C., N.
rufimanus *Kirby* [reflexus *Putz.*]. Y.F.? N.O.
cylindrica *Lec.* N.O., W., C.L., O.
elongata *Lec.* N.
latior *Kirby* [libera *Lec.*]. St. L., T.L.
angustata *Say*. L'O.
pallipes *Kirby*. St. L.
impuncticollis *Say*. L'O., St. L., S.M., O.K., O.
littoralis *Mann.* C.R.
fallax *Lec.* St. L., B.C., W., C.L.
protensa *Putz.* N.O.
erratica *Sturm.* B.C., H.M., T.L., N.
interstitialis *Dej.* St. L., C.L., T.L., O., N.
obesa *Say*. W., S.M.
musculus *Say*. W., N.

(To be continued.)

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 120, Volume xxii.)

Genus ANTARCTIA Hbn.

1816—Hübner, Verzeichniss, 192.
1864—Pack., Proc. Ent. Soc., Phil., III., 122.
1873—Stretch, Zyg. & Bomb., 191.

The head is small and retracted; tongue obsolete, palpi very small and weak; antennæ moderately long, bipectinated in the male, simple in the female: the pectinations are long and extend to the tip; legs short and weak, all the spurs present, but very short: the two pairs of the posterior tibiæ close together. The tarsal claws are as in *Spilosoma*, and, indeed, there is no structural difference between these two genera. *Antarctia* has shorter, broader wings, somewhat longer vestiture, and is not white!

Primaries with 7 to 10 stalked, the branches arising in pairs; 3 to 5 from the end of the median, and about one-half closer to 5 than to 6. Secondaries 6 and 7 together from the end of the sub-costal; 8 rather closer to base than usual; 4 and 5 together from the end of the median, 3 very close to the end.

A. punctata Pack.

1864—Pack., Proc Ent. Soc., Phil., III., 123, *Antarctia.*
1873—Stretch, Zyg. & Bomb., 192. =*vagans.*
1875—Edw., Proc. Cal. Ac. Sci., V., 188, *Antarctia.*
rufula ♀ Bdv.
1855—Bdv., Ann. Soc. Ent. Fr., 1855, Bull., p. 32, *Nemeophila.*
1868—Grt. & Rob., Cat. Lep. N. A., *Nemeophila.*
1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 79 *Arctia.*
1870—Grt. & Rob, Tr. Am. Ent. Soc., III., 175, *pr. syn.*
1875—Edw., Proc. Cal. Ac. Sci., V., 367, *pr. syn.*
1881—Neum., Papilio, I., 80, *pr. syn.*
var. *proba* Hy. Edw.
1881—Edw., Papilio, I., 39, *Antarctia.*
Habitat—Sierra Nev., California, Oregon.

A. rubra Neum.

1881—Neum., Papilio, I., 79, *Antarctia.*
1881—Butl., Ann. Mag. N. H., ser. 5, VIII., 311, *Antarctia.*
Habitat—Oregon, California.

A. vagans Bdv.

1852—Bdv.*, Lep. Cal. (Ann. Soc. Ent. Fr., 2 ser. X., 322), 50, *Arctia.*
1856—Wlk., C. B. Mus., Lep. Het. III., 630, *Phragmatobia.*
1860—Clem., Pr. Ac. N. Sci. Phil. XII., 336, *Phragmatobia.*
1862—Morris, Synopsis, 346, *Phragmatobia.*
1864—Pack., Proc. Ent. Soc. Phil., III., 122, *Phragmatobia.*
1868—Grt. & Rob., Cat. Lep. N. Am., *Phragmatobia.*
1869—Bdv., Lep. Calif. (Ann. Soc. Ent., Belg., XII.), 79, *Arctia.*
1873—Stretch, Zyg. & Bomb., 192, pl. VIII., ff. 8–12, *Antarctia.*
pteridis Hy. Edw.
1875—Edw., Proc. Cal. Ac. Sci., V., 264, *Antarctia.*
1875—Edw., Proc. Cal. Ac. Sci., V., 367, *pr. syn.*
var. *rufula* Bdv.
1852—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 80, *Arctia.*
1873—Stretch, Zyg. & Bomb., 192, *pr. syn.*
1881—Neum., Papilio, I., 79, *pr. var.*
Habitat—California, Vancouver.
Food plant—*Lupin* (Stretch).

A. walsinghami Butl.

1881—Butl., Ann. & Mag. N. H., ser. 5, VIII., 311, *Antarctia.*
Habitat—Oregon.

The synonymy in this genus is far from settled. There are probably fewer species than are given here. At all events, I do not see why *rufula* must not replace *punctata* Pack., for, though the male was a mere variety of *vagans*, the female referred to a good species, and the name cannot be dropped, because in part a synonym. I have not made the change here, but content myself with calling attention to the necessity for it.

Genus Leucarctia Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 124.

Head small and retracted; palpi short; tongue short and weak. Antennæ short, pectinated in both sexes, the pectinations in the female

short, but nearly as long as those of the male. Legs short and stout, anterior tibiæ with a short stout spine at either side of tip ; middle and posterior tibiæ with minute terminal spurs only. The claws of tarsi are toothed in both sexes.

Primaries with 7 to 10 from a stalk in the order 10, 7, 8, 9 ; 3 to 5 from end of median, 4 nearer to 5 than to 3.

Secondaries 6 and 7 from same point at end of sub-costal ; 8 from sub-costal half way to base ; 3 to 5 almost equidistant from end of median.

Moeschler, in 1876, Stett. Ent. Zeit., XXXVII., 297, makes this a synonym of *Spilosoma*.

L. acræa Drury.

1770—Drury, Exot., I., pl. III., f. 2 (♀) and 3 (♂), *Phalæna*.
1793—Fabr., Ent. Syst., III., 1, 451, *Bombyx acria*.
1797—Sm. & Abb.*, Ins. Ga., II., 133, pl. 67, *Phalæna acria*.
1816—Hüb., Veizeichniss, 184, *Estigmene*.
1820—Hüb., Samml. Auss. Schmett, II., pl. 404, *Estigmene acria*.
1823—Harris*, Mass. Agr. Repos. & Journ., VII., 323, *Arctia*.
1833—Harris, Cat. Ins. Mass., 591, *Arctia*.
1837—Westw., ed Dru., I., 7, *Spilosoma*.
1841—Duncan*, Nat. Libr., XXXII., 171, pl. 20, ff. 1–3, *Spilosoma*.
1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 53, *Spilosoma*.
1862—Morris*, Synopsis Supplt., 342, *Spilosoma*.
1862—Harris*, Inj. Ins., Flint, ed. 351, f. 169, pl. VI., ff. 9 (♂) and 10 (♀), *Spilosoma*.
1864—Pack., Proc. Ent. Soc., Phil., III., 125, *Leucarctia*.
1869—Bdv., Lep. Calif. (Ann. Soc. Ent., Belg., XII.), 78, *Arctia acria*.
1873—Stretch*, Zyg. & Bomb., 99, pl. 4, ff. 1–3, and pl. 10, f. 6, *Leucarctia*.
1874—Morrison, Psyche, I., 21, *Leucarctia*.
1875—Edw.*, Proc. Cal. Ac. Sci., V., 368, *Leucarctia*.
1883—Weed, Papilio, III., 84, *Leucarctia*.
1883—Grt., Papilio, III., 84, *Leucarctia*.
1883—Stretch, Papilio, III., 141, *Leucarctia*.
1884—Bean*, Can. Ent., XVI., 66, *Spilosoma*.
1886—Smith, Ent. Amer., II., 79, *Leucarctia*.

pseuderminia Peck.

1823—Peck., Mass. Agr. Rep. & Journ., VII., 328, pl. 1, *Arctia.*

1837—Westw., ed. Drury, I., 7, *pr. syn.*

1855—Wlk., C. B. Mus., Lep. Het., III., 667, *Spilosoma.*

caprotina Drury.

1770—Dru., Exot., I., pl. 3, f. 3, *Phalæna.*

1782—Cram., Pap. Exot., III., 170, pl. 287, f. C, *Phalæna.*

1797—Sm. & Abb., Ins. Ga., II., 133, *pr. syn.*

1837—Westw., ed. Dru., I., 7, *pr. syn.*

californica Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 125, *Leucarctia.*

1872—Pack., 4th Rept. Peab. Ac., 86, *pr. syn.*

packardii Schaupp.

1882—Schaupp, in Check List Bkln. Ent. Soc., 8, *Spilosoma.*

Habitat—United States and Canada.

Food plant—Omnivorous.

L. albida Stretch.

1873—Stretch, Zyg. & Bomb., 203, pl. 8, f. 22, *Leucarctia.*

1875—Butler, Cist. Ent., II., 36, *an sp. dist. virginica ?*

1876—Stretch, Rept. Geol. Surv., west 100 merid., V., 798, pl 40, ff. 4 and 5, *Leucarctia.*

Habitat—California.

The *Arctia scuirus* of Boisduval was referred by Grote and Robinson to *acræa*, but is now recognized as referring to *Euchaetes collaris !* The peculiar male characters of the *acræa* have been described by Mr. Morrison, and later figured by myself.

Leucarctia permaculata Pack. is an *Ecpantheria*, and is referred to under that genus. I do not find the species in Mr. Grote's list, but perhaps it may be referred to in some paper which I have not seen.

(To be continued.)

Mailed July 4th.

The Canadian Entomologist.

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THE NOCTUIDÆ OF EUROPE AND NORTH AMERICA COMPARED.

(Eighth and Last Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

Tribe *Catocalini.*

In this tribe the secondaries are oftenest gaily coloured (mostly yellow) and banded, still subordinated to the primaries which show, more or less adequately, the usual Noctuidous ornamentation. The abdomen is rarely tufted. On account of the shape of the primaries, the form of the abdomen, the abdominal tuftings, the pattern of the wings beneath, the approach to *Ophideres*, I regard the genus and species *Euparthenos nubilis*, Ann N. Y. Lyc. Nat. Hist., as entirely distinct from *Catocala* sp. The most important genus is *Catocala*, in Europe with 22, in North America with upwards of 100 species. A division of this genus on the peculiarities of tibial armature (as I have suggested in *Agrotis*) was stated to me as possible several years ago by Mr. Smith, and has more recently been attempted by Mr. Hulst. I must think that his observations need verifying, judging from his published opinions on the value of the forms of *Catocala*, which I have shown to be in a number of instances incorrect. The *Ophiderinæ* and *Toxocampinæ* of my Check List are probably not to be separated from this tribe, in which the anterior ventral feet of the larvæ are more or less incomplete. The genera become gradually broader winged and concolorous as we approach the next tribe.

Tribe *Pheocymini.*

This comprises the *Erebiinæ* of my Check List. The wings are marked by rivulous lines crossing both pair and recalling the Spanner

moths. The tibiæ are variously armed, but become unarmed in the weaker genera, *Homopyralis*, etc., and as we approach the *Deltoidinæ*. In Europe this tribe seems represented only by *Pericyma* and *Zethes*. As we go southward the moths of this tribe become more numerous and we find the largest *Noctuidæ* among them in *Erebus* and *Thysania*. The tribe is tropical and subtropical, and some of the species are summer migrants from the South, not breeding in the Middle and Eastern States, or Canada.

There remain to be considered certain tropical forms which are found in Florida, or accidentally on our coast, such as *Hexeris enhydris*, *Syllectra erycata* and *Brotis vulneraria*. These probably are to be separated as affording distinct tribal types, but I cannot at the moment compare their structure with that of their South American allies. The tribe *Pangraptini*, with the frail genera *Pangrapta* and *Phalaenostola*, seems to close the series and lead to the Deltoids. The North American genera must be compared here with their tropical allies. This element of our fauna comes from the south, and, as we have seen, is almost wanting in Europe.

Sub-family *Deltoidinæ*.

This sub-family was formerly regarded as belonging to the *Pyralidæ*. In the vernacular the Deltoids are called "Snout Moths," from the long labial palpi. But Herrich-Schæffer showed that in their essential characters they conform to the Noctuid type; they are pyralidiform *Noctuidæ*. The wings are usually pointed at the tips, the colours are gray and dusty, the usual Noctuid ornamentation is hardly to be discerned. The eyes are always naked. They fall into two principal tribes. The character of this sub-family becomes again largely European. As the name "Snout Moths" refers to this sub-family, I have called the *Pyralidæ* by the name of Sparkler Moths.

Tribe *Herminiini*.

The type of this tribe is the European *Herminia tentacularis*, to which our North American *Philometra* is related. The wings are concolorous, marked with continuous lines, reminding us of the *Pheocymini* and the *Geometridæ*. The antennæ are often furnished with sexual nodosities. The species fly in grass upon which the larvæ generally feed.

One of the most variable *Noctuidæ* known to me belongs to this tribe, *Zanclognatha lævigata*. Our species resemble generally the European, but are much more numerous.

Tribe *Hypenini*.

The type of this tribe is the European *Hypena proboscidalis*. The hind wings are unicolorous and subordinate to the primaries, which show the usual Noctuid markings more or less distinctly. The body is sometimes tufted, the brush-like antennæ are simple. In *Bomolocha* the eyes are lashed, but this character has nothing to do with the hairiness or nakedness of the eye itself, which, in the *Deltoidinæ*, so far as I know, is always naked. This nakedness is a general characteristic of the lower moths. I know of only one Geometrid with hairy eyes. The genera in my Check List, down to *Hypenula*, referred to this tribe, should probably be included in the preceding.

Sub-family *Brephinæ*.

The members of this small sub-family group are boreal or sub-boreal in their habitat, and resemble certain *Geometridæ*, inhabiting similar zoological zones, in their hairy body, a more or less marked diurnal flight, and the 16-footed larvæ. The ocelli are wanting, and this character excludes the Californian genus *Annaphila*, which is really related to *Eustrotia (Erastria)*, but has a certain resemblance in colours to this sub-family and the *Catocalini*. Our single species, *Brephos infans*, is found from Labrador to New England. Another form, *Leucobrephos brephoides*, I identified originally from Hudson's Bay. It may be the same with a species described by me from Wisconsin, and, among the figures of Siberian moths which I have examined, is one which, I think, represents a form belonging to this North American genus. Europe has three species of *Brephos* Hübn. (nec. Ochs.). The name *Brephos*, like *Agrotis*, etc., was originally proposed by Hübner. Through neglect and corruption, Hübner's names became credited to other European writers. I have done my best to clear up the generic synonymy by indicating the types in my Buffalo Lists. The student is referred to these for special information on this point.

Although the Owlet moths are quite numerous in the east, yet the Western States of North America seem richer in genera and

species. The different elements among the numerous genera need bringing out, but it has been sufficiently shown here where the general lines of relationship are to be sought. Like the Hawk moths, these too have been redistributed by climatic changes, the most important of which was the Glacial Epoch. We receive a large accession from the south, but the bulk of our *Noctuidæ* show a northern parentage. The common ancestors of certain of the European and American Owlet moths of to-day had, at one time, a common sporting ground. I have shown the existence of every grade of resemblance from undistinguishable species like *Scoliopteryx libatrix* and *Dipterygia pinastri*, through slightly modified forms like *Apatela occidentalis*, *Dianthoecia bella*, *Copimamestra occidenta*, *Agrotis normaniana*, *Lithophane Thaxteri*, to forms readily distinguishable in all their stages by the experienced student. The mass of species is so great that detailed observations on each particular one must await time; but I trust I have laid down the lines by which our Owlet moths are to be studied until our information with regard to them is perfected.

Some idea of the preponderance of *Catocalinæ* in North America may be given by the statement that in Europe there are about fifty-six species belonging to about sixteen genera, while in North America there are about two hundred and fifty species belonging to about fifty-six genera. These latter figures may be changed by new observations with us, but hardly diminished. In the *Deltoidinæ* the proportions are more in conformity with the numerical relations in the typical group, the *Noctuinæ*. The reason I have given for this preponderance of the *Catocalinæ*, lies in the physical geography of the continent, the prevailing atmospheric and ocean currents, all of which favor the introduction of southern or tropical lepidopterous forms. And we must consider the *Catocalinæ* as tropical in general character in the same way as we consider the other groups of the *Noctuidæ* as belonging to temperate regions of the earth's surface.

In a general view of the evolution of the Lepidoptera we may conceive it as represented by an inverted and spreading bell of net work, in hanging threads of unequal lengths, branching variously and in different directions, and ever widening in departure and circumference. The depending tips of the threads represent the existing species, all connected with the past, and the task before us is the tracing of the threads, always running here and there together, grouping themselves about thicker strands, converging in the hand of time. The means at our disposal for the un-

ravelling are the characters of existing species in *all* their stages, and the sadly imperfect, almost failing, record of fossil species. To add to the difficulty, the species have been distributed and redistributed, affected by geological changes, modified by differences in temperature, moulded by the winds. It is clearly impossible to arrange existing species in a linear series and thereby express also their probable descent. We can only group them according to natural characters and for purposes of convenience. Undoubtedly our categories, through their characters, correspond vaguely to the general plan of evolution. But the arrangement of our catalogues and collections must remain artificial in the main, conditioned by our own physical limitations. Our mental picture of these insects remains relatively imperfect, but enlarges through new studies and fresh thoughts.

Errata et Addenda.—Vol. XXI., p. 123, line 10, for *Noctuidæ* read *Noctuinæ*; id., p. 155, line 30, for *Dasychininæ* read *Dasychirinæ*. The first three North American genera in the list, on p. 157, I refer to the tribe *Bombycoidi*, the rest to the *Apatelini;* the tribal divisions accidentally omitted. Id., p. 189, line 34, for merely read mainly. In connection with my remarks on *Gortyna*, p. 192, I refer to my paper on this genus and *Ochria*, p. 139, written subsequently. Id., p. 229, line 19, insert "apices of the" before "still pointed primaries"; id., p. 230, line 29, for *pyramided* read *pyramidea*; id., p. 230, after *saucia* insert *clandestina*; Vol. XXII., p. 29, line 23, for *Calopharia* read *Calophasia*; id., p. 30, line 2, for form read tribe; id., p. 30, line 9, for slimy read shiny; id., id., line 17, for *Hatney* read *Hatuey;* id., p. 28, line 3, dele "or *Morrisoni*." Dr. Thaxter inclines to consider *sidus* = *vinulenta*, while I sought for it in red forms of *Walkeri*. The latter species is nearer the European *satellitia*, which *tristigmata* also resembles. Without Guenée's type I think no certainty can be obtained. While I think the outlines of a more correct classification of the family are here given, certain points remain to be discussed, such as the separation of *Ingura* as a distinct tribe, while the location of certain genera will be altered when minuter comparisons can be made and the full life history of the species is known. As nature did not produce these creatures in a linear series, one after another, we can only approximately exhibit their relations in our catalogues and collections.

A REPLY TO MR. W. H. EDWARDS.

BY H. J. ELWES, PRESTON, CIRENCESTER, ENGLAND.

I am surprised to see in the May number of the CANADIAN ENTOMOLOGIST a criticism of my paper on "Argynnis" in a style which is not easy to reply to, and which is certainly not justified by the paper itself. Mr. Edwards seems to think that no one has a right to question his opinions on butterflies until they have seen the so-called types from which his original descriptions were made, and that the practical monopoly which he has lately held in the description of new species in the United States gives him the position of an oracle. He accuses me of haste and carelessness, of not having taken the trouble to see what I could easily have seen, and implies that I have not seen the species I have written about. I will only ask those who may be interested, to read my paper* in full and not to judge from the abridgement of it which was published in the March number of *Psyche*. I will also ask them to refer to *Papilio*, Vol III., p. 152. It will there be seen that I have for seven years been collecting all available material for the better understanding of a genus which, naturally difficult in itself, has been rendered doubly so by Mr. W. H. Edwards. It will be seen that in 1883 I had publicly, as well as privately, asked him to inform me how I could identify species which had been described by him, often from very imperfect or scanty specimens—sometimes in such inaccessible publications as *Field and Forest*, and usually, if not always, without giving any characters by which the species could be distinguished from its near allies. To these questions I have received no reply. My valued correspondent, Mr. H. Edwards, "whose judgment in doubtful cases Mr. W. H. Edwards relies on above all persons," had kindly sent me a considerable number of the rarer western forms named by himself. Mr. H. Strecker, who certainly has as good an eye for, and as good a judgment of species as almost any one I met in America, sent me many more, and in various ways I had collected all the known so-called species except four, of two of which I had seen the types, so that I have, as I believe, a larger and better series than any one in Europe or in any of the collections I was able to examine in America. I did not therefore write hastily or carelessly, and the numerous queries in my synopsis show how uncertain I still felt of the proper position and specific value of many of

* A copy will be sent, as long as they last, to any Entomologist who will write for it to me at Preston, Cirencester, England.

the western forms. After having repeatedly tried to find in Mr. Edwards's published figures, all of which I have carefully studied, any help in separating these doubtful forms, I had visited and examined the collections of Mr. Holland (who, I was informed, had acquired Mr. Edwards's types), of the Harvard Museum; of Messrs. H. Edwards, Strecker, Neumogen, Hulst, Scudder and Dr. Behr, to all of whom my best thanks are due; after having gone through all the American and European literature and museums, and written to every one from whom I hoped to learn anything, and after having collected personally in Southern and Northern California and the Yellowstone Park, I am told I have no claim to know anything about "Argynnis," as I have seen mostly second or third rate collections. (Where then are the first rate ones that I did not see?)

I am pleased to learn, that whatever Mr. Edwards's opinion of my work may be, it is not shared by all of his countrymen, from three of the most able of whom I have received flattering approvals of my attempt to enable others to understand this genus, and to arrange their collections on a more rational basis. Mr. Edwards implies that I pay no regard to local variation, that I do not allow that locality is any help in deciding the name of a species, and am generally inclined to lump everything that I do not know.

Will he then see how slight a difference is sufficient in my eyes to separate a local variety, as in the case of the Himalayan form of *A. lathonia*, or a local race worthy to be called a species, such as *A. montinus*, and how I have tried to make these slight differences clear to my readers, as in the case of *A. helena*?

Let him do the same with *Chitone*, *Cipris*, *Inornata*, *Hippolyta* and others, and he will find me the most appreciative of his followers.

But when he rambles on in the way he sometimes does, failing to recognize his own species when they are sent to him for name from unexpected localities, as I am told he has done, I can only say that the fact of a butterfly being confined to one station is not enough to separate it specifically unless it has through isolation or climatic influences developed some peculiarity by which it may invariably be recognized as having come from that place. I do not blame him for describing such things twenty years ago, but I say that now, after he has himself proved by breeding the extraordinary amount of variation to which many species are subject, he has no right to expect anyone at once to recognize as a species such a

form as *Argynnis Alberta*, which he has just described from one ♂ and two ♀ sent him by Mr. Bean.

It would be useless for me to reply in detail to his remarks upon particular species, because he will always fall back upon his so-called types, whilst others must rely on his published work, if they can get it, and if not, upon the best materials they can get. No doubt there are many errors in my arrangement which only time and better knowledge can clear up. I shall welcome the criticism of any one who will show me where I am wrong, and who has better means of coming at the truth than I have, but I am quite content to live under Mr. Edwards's aspersions in such good company as that of Dr. Hagen, and hope that Mr. Edwards will think better of us both when he gets cooler.

A NEW PSEUDOSCORPION.

BY NATHAN BANKS, ITHACA, N. Y.

Upon looking over the specimens of this family, which I had collected during the past few years near Ithaca, I discovered a new species of *Chernes*, which may be characterized as follows :—

Chernes pallidus, nov. spec. Length about 2 m.m.; body ovate oblong ; cephalothorax a little broader behind than in front ; finely serrulate on the margin ; body finely granulate and furnished with short, yellowish, clavate hairs. Abdomen pale yellowish ; cephalothorax reddish near anterior end ; palpi a uniform red ; legs yellowish ; no light median line on dorsum. No eyes ; palpi stout, longer than the body ; 3rd joint nearly as long as cephalothorax, and three times as long as 2nd ; 4th a little shorter than 3rd ; hand large and stout, fingers a little curved. Larger than *C. Sanborni* H. and *C. oblongus* Say, the palpi larger and longer, and the legs much stouter than in these species. In *C. Sanborni* H. the 3rd joint of palpi is but twice as long as the 2nd. *C. oblongus* is smooth, not granulate ; one specimen, Ithaca.

The following species are also found near Ithaca : *Chernes Sanborni* H., several specimens ; *Chernes oblongus* Say, more common ; *Chelifer cancroides* L., in houses ; *Chelifer muricatus* Say, one specimen ; *Obisium bruneum* H., several specimens ; *Chthonius pennsylvanicus* H., three specimens.

ON THE LISTS OF COLEOPTERA PUBLISHED BY THE GEOLOGICAL SURVEY OF CANADA, 1842–1888.

BY W. HAGUE HARRINGTON, OTTAWA.

(Continued from page 140, Vol. xxii.)

Diplochila major *Lec.* [Rhembus]. A.O.
Calathus gregarius *Say*. L'O., St. L.
ingratus *Dej*. N.C., C.L., O.K., O., N., R.A.
race confusus *Lec*. B.C.
mollis *Esch.*, *race* lenis *Mann*. B.C.
impunctatus *Say*. St. L.
Platynus maurus *Mots.* [stygicus *Lec.*]. Y.F.
sinuatus *Dej*. A.O., St. L., B.C., C.L., T.L., O.
extensicollis *Say*. St. L,
anchomenoides *Rand*. B.C.
tenuis *Lec*. St. L.
melanarius *Dej*. St. L., B.C., C.L.
affinis *Kirby*. M.F.
metallescens *Lec*. O.K., O.
deceptivus *Lec*. O.K.
cupripennis *Say*. L'O., St. L., W., S.M.
perforatus *Lec*. O.
placidus *Say*. St. L., W.
cupreus *Dej*. W., S.M., C.C.
Bogemanni *Gyll*. [obsoletus *Say*]. A.O., W., S.M., M.F., O., N., C.R.
race strigicollis *Mann*. B.C.
quadripunctatus *DeG*. W., O.
sordens *Kirby*. T.L.
ruficornis *Lec*. N.C., N.
retractus *Lec*. A.O., St. L., B.C., W., O.K.
picipennis *Kirby*. St. L.
lutulentus *Lec*. St. L.
Lebia cyanipennis *Dej*. B.C.
viridis *Say*? A.O.
Metabletus americanus *Dej*. [borealis *Zimm.*]. B.C., N.O.
Cymindis cribricollis *Dej*. [reflexa *Lec.*]. L'O., St. L., B.C., N.O. H.M., O.K., C.R.

Chlænius sericeus *Forst.* L'O., St. L., S.M.
leucoscelis *Chev.* [chlorophanus *Dej.*]. St. L.
tricolor *Dej.* L'O., St. L.
pennsylvanicus *Say.* O.K.
impunctifrons *Say.* A.O.
Agonoderus pallipes *Fab.* W.
Harpalus amputatus *Say.* W.
viridiæneus *Beauv.* St. L.
pennsylvanicus *DeG.* L'O., W., S.M.
megacephalus *Lec.* St. L.
pleuriticus *Kirby.* St. L., W., C.L., S.M., O., N.
herbivagus *Say.* L'O., N.O., W., S.M.
cautus *Dej.* B.C.
rufimanus *Lec.* St. L.
oblitus *Lec.* B.C.
basilaris *Kirby.* B.C.
ruficornis (misprint ?). B.C.
Stenolophus conjunctus *Say.* B.C., S.M.
Bradycellus cognatus *Gyll.* O.K.
rupestris *Say.* W.
Tachycellus nigrinus *Dej.* [Bradycellus]. T.L.
Anisodactylus piceus *Mén.* B.C.
rusticus *Dej.* L'O.
californicus *Dej.* [confusus *Lec.*]. B.C.
Harrisii *Lec.* L'O., St. L.
baltimorensis *Say.* L'O., S.M.

Haliplidæ.

Haliplus cribrarius *Lec.* A.O.
ruficollis *DeG.* (immaculaticollis *Harr.*). A.O.

Dytiscidæ.

Laccophilus proximus *Say.* C.L.
Cœlambus inæqualis *Fab.* [Hydroporus]. H.M.
ovoideus *Lec.* [Hydroporus]. Y.F.
impressopunctatus *Sch.* [Hydroporus]. Y.F.

Deronectes depressus *Fab.* [Hydroporus rotundatus *Lec.*]. O.K.
griseostriatus *DeG.* [Hydroporus]. B.C.
Hydroporus proximus *Aubé.* A.O.
sericeus *Lec.* H.M.
alpinus *Payk.* O.
tartaricus *Lec.* Y.F.
tristis *Payk.* [subtonsus *Lec.*]. Y.F.
modestus *Aubé.* Y.F.
Ilybius confusus *Aubé.* H.M., N.
Coptotomus interrogatus *Fab.* A.O.
Agabus parallelus *Lec.* O.K.
seriatus *Say.* A.O., St.L.
punctulatus *Aubé.* N.
anthracinus *Mann.* [scapularis *Mann.*]. B.C.
infuscatus *Aubé.* B.C.
Erichsoni *G. & H.* [nigroæneus *Er.*] [lutosus *Cr.*]. B.C., N.C., O.K.
dissimilis *Sahl.* [Gaurodytes longulus *Lec.*]. Y.F.
Rhantus binotatus *Harr.* [Colymbetes]. B.C., S.M.
tostus *Lec.* [Colymbetes]. B.C.
Colymbetes sculptilis *Harr.* [Cymatopterus]. B.C., M., H.M., O.K., N.
Dytiscus circumcinctus *Ahr.* [anxius *Mann.*]. B.C., N.C.
dauricus *Gebl.* [confluens *Say*]. St.L., N.C., M.F., O., N.
Harrisii *Kirby.* H.M.
lapponicus [*Gyll?*]. O.K.
Acilius semisulcatus *Aubé.* H.M.
fraternus *Harr.* L'O.

Gyrinidæ.

Gyrinus confinis *Lec.* M.F.
limbatus *Say.* H.M.
ventralis *Kirby.* B.C., O., C.C.
affinis *Aubé.* M.F.
pectoralis *Lec.* H.M.
borealis *Aubé.* H.M., N.
picipes *Aubé.* B.C.
Dineutes emarginatus *Say.* O.K.

Hydrophilidæ.

Helophorus lineatus *Say*. Y.F.
Berosus striatus *Say*. W.
Philhydrus cinctus *Say*. A.O.
perplexus *Lec*. Y.F., T.L.
Hydrobius fuscipes *Linn*. B.C., Y.F.

Silphidæ.

Necrophorus Sayi *Lap*. [lunatus *Lec*.]. A.O.
marginatus *Fab*. [Silpha]. A.O.
vespilloides *Hbst*. [pygmæus *Kirby*]. A.O., M., O., N.
tomentosus *Web*. [velutinus *Fab*.]. St.L.
Silpha surinamensis *Fab*. L'O., T.L.
lapponica *Hbst*. St.L., B.C., N.C., N.O., C.L., M., H.M., O., N.
trituberculata *Kirby*. N.C., C.L.
americana *Linn*. S.M., M.F.
Choleva basillaris *Say* [Spenciana *Kirby*]. B.C., M.F., O.K.
Liodes globosa *Lec*. S.M.

Staphylinidæ.

Quedius fulgidus *Fab*. B.C.
lævigatus *Gyll*. T.L.
Listotrophus cingulatus *Grav*. W., S.M.
Creophilus villosus *Grav*. [Staphylinus]. St.L., B.C., N.O., C.L., O.
Philonthus æneus *Rossi*. S.M.
cyanipennis *Fab*. A.O.
Lathrobium simile *Lec*. N.C.
Pæderus littorarius *Grav*. L'O.
Tachinus fumipennis *Say* (conformis *Dej.*). A.O.
Tachyporus jocosus *Say*. O.
Oxytelus pennsylvanicus *Er*. A.O.
Porrhodites fenestralis *Zett*. O.
Olophrum rotundicolle *Sahlb*. O.
Anthrobium pothos *Mann*. A.O., B.C.

Coccinellidæ.

Anisosticta strigata *Thunb.* O.
Hippodamia 5-signata *Kirby.* B.C., N.C., N.
13-punctata *Linn.* L'O., N., C.C.
Coccinella trifasciata *Linn.* B.C., S.M., N.
9-notata *Hbst.* [novemnotatem *Fab.*]. St.L.
transversoguttata *Fab.* [5-notata *Kirby*]. B.C., N.
Harmonia picta *Rand.* [Coccinella]. A.O., B.C., H.M., M.F., T.L.
12-maculata *Gebl.* [Coccinella]. N.C.
Mysia pullata *Say.* S.M.
Anatis 15-punctata *Oliv.* N.O., N., R.A.
Psyllobora 20-maculata *Say.* B.C.

Cucujidæ.

Pediacus fuscus *Er.* (planus *Lec.).* A.O., St.L., N.O., S.M., O., C.C.
Cucujus clavipes *Fab.* A.O.
puniceus *Mann.* B.C.

Dermestidæ.

Dermestes caninus *Germ.* [nubilus *Say*]. O.
talpinus *Mann.* B.C., N.O.
lardarius *Linn.* A.O., S.M., N.
Attagenus piceus *Oliv.* [megatoma *Fab.*]. O.
Trogoderma tarsale *Melsh.* [inclusum *Lec.*]? O.
Anthrenus musæorum *Linn.* (castaneæ *Melsh.*). A.O.

Histeridæ.

Hister abbreviatus *Fab.* S.M.
depurator *Say.* B.C., S.M.
perplexus *Lec.?* L'O.
parallelus *Say* (Platysoma). A.O.
Dendrophilus punctulatus *Say.* S.M.
Saprinus oregonensis *Lec.* N.O., S.M.
fraternus *Say.* S.M.
mancus *Say.* S.M.
estriatus *Lec.* B.C.

NITIDULIDÆ.

Carpophilus niger *Say*. A.O.
Epuræa rufa *Say*. S.M.
immunda *Sturm*. O.K.
Nitidula bipustulata *Linn*. S.M.
Omosita colon *Linn*. St.L.
discoidea *Fab*. B.C.
Ips fasciatus *Oliv*. (4 signatus *Say*) [4-guttatus *Fab*.]. L'O., T.L.

TROGOSITIDÆ.

Peltis ferruginea *Linn*. B.C.
Calitys scabra *Thunb*. [dentata *Fab*.] B.C.
Thymalus fulgidus *Er*. C.R.

BYRRHIDÆ.

Cytilus sericeus *Forst*. (varius *Fab*.). L'O.
trivittatus *Melsh*. B.C.
Byrrhus Kirbyi *Lec*. [picipes *Kirby*]. St.L., B.C.

DASCYLLIDÆ.

Scirtes tibialis *Guér*. N.O.
Cyphon variabilis *Thunb*. S.M.

ELATERIDÆ.

Adelocera rorulenta *Lec*. B.C.
profusa *Cand*. B.C.
Cryptohypnus abbreviatus *Say* [silaceipes *Germ*.). A.O., B.C., S.M.
Elater nigrinus *Payk*. O.K., N.
luctuosus *Lec*. O.
apicatus *Say*. W., S.M.
Agriotes mancus *Say*. S.M.
stabilis *Lec*. (Dolopius). A.O.
fucosus *Lec*. (Dolopius). A.O., W., S.M.
oblongicollis *Melsh*. S.M.
Dolopius lateralis *Esch*. S.M.
Sericosomus incongruus *Lec*. B.C., N.

Corymbites virens *Schr.* [æneicollis *Ol.*]. B.C., O.K., O., N.
resplendens *Esch.* N.
spinosus *Lec.* O.
caricinus *Germ.* [umbricola *Esch.*]. B.C.
ochreipennis *Lec.* O.K., N., R.A.
triundulatus *Rand.* A.O., N.O.
cruciatus *Linn.* B.C., S.M.
Suckleyi *Lec.* B.C.
æripennis *Kirby.* B.C., C.L., O.
metallicus *Payk.* O.
Asaphes memnonius *Hbst.* S.M.

Buprestidæ.

Chalcophora virginiensis *Drury.* S.M.
Dicerca prolongata *Lec.* B.C., W., C.L., O., N.
tenebrosa *Kirby.* B.C., M., O.
Buprestis consularis *Gory.* S.M.
Nuttalli *Kirby.* N.C., N.O., O., N., C.C.
maculiventris *Say* (Ancylochira). A.O., St.L., M., O.K.
rusticorum *Kirby.* C.L., S.M., H.M., O.
fasciata *Fab.* S.M.
race Langii *Mann.* W.
Melanophila acuminata *DeG.* [longipes *Say*] [appendicula *Fab.*] B.C., W., S.M., N., C.C., C.R.
Drummondi *Kirby.* B.C., N.C.
Anthaxia æneogaster *Lap.* [inornata *Rand.*]. B.C.
Chrysobothris dentipes *Germ.* S.M.
trinervia *Kirby.* N.C., N.O., S.M., O.K.

Lampyridæ.

Calopteron terminale *Say* (Digrapha). A.O.
Celetes basalis *Lec.* O.K.
Eros simplicipes *Mann.* B.C.
aurora *Hbst.* [coccinatus *Say*]. A.O., B.C.
Plateros caniculatus *Say.* S.M.
lictor *Newm.* (mollis *Lec.*). A.O.

Ellychnia corrusca *Linn.* A.O., St.L., N.C., S.M., M.F., O.K., T.L., O., N.
race lacustris *Lec.* A.O., Y.F.
Pyractomena angulata *Say.* A.O.
Photinus ardens *Lec.* S.M.
Photuris pennsylvanica *DeG.* L'O., S.M.
Podabrus modestus *Say.* A.O., W.
piniphilus *Esch.* B.C., N.C., (allied to piniphilus).
puberulus *Lec.* N.O., S.M.
lævicollis *Kirby.* B.C.
Telephorus fraxini *Say.* A.O., B.C., N.C., N.O., S.M.
carolinus *Fab.* A.O.
nigritulus *Lec.* N.O.
scitulus *Say.* S.M.
rotundicollis *Say.* A.O.
Curtisii *Kirby.* B.C.
grandicollis *Lec.* B.C.

MALACHIDÆ.

Collops tricolor *Say.* O.K.
vittatus *Say.* C.C.

CLERIDÆ.

Trichodes Nuttalli *Kirby.* L'O.
Clerus spegeus *Fab.* B.C.
Thanasimus dubius *Fab.* L'O.
undulatus *Say* [Clerus]. B.C., Y.F., N.O., C.L., S.M., O.
Hydnocera humeralis *Say.* R.A.
Necrobia violaceus *Linn.* [Corynetes]. B.C., T.L.

PTINIDÆ.

Hadrobregmus foveatus *Kirby* (Anobium). A.O., O.
Dinoderus substriatus *Payk.* C.R.

LUCANIDÆ.

Platycerus depressus *Lec.* A.O., St.L., B.C., S.M.

(To be continued.)

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 144, Volume xxii.)

Genus SPILOSOMA Steph.

1830—Steph., Ill. Br. Ent., Haust., II., 74.
1856—Wlk., C. B. Mus., Lep. Het., III., 663.
1860—Clem., Proc. Ac. N. Sci, Phil, XII., 531.
1873—Stretch, Zyg. & Bomb., 130.

Head small, retracted; tongue short and weak, membraneous; palpi very short and feeble. Legs moderate, rather short; tibial spurs present but very feebly developed. Fore tibiæ unarmed. Antennæ moderately long, bipectinated in the male, simple or serrate in the female. The tarsal claws are toothed in all the species examined. In *virginica* the posterior tarsi only, in *vestalis* all are toothed.

The primaries have the cell somewhat shorter than usual, veins 7 to 10 on a stalk from the end of the subcostal in the order 10, 7, 9, 8; 3 to 5 are from the end of the median, 4 rather closer to 5 than to 3.

Secondaries with 6 and 7 together from the end of the subcostal, 8 from same rather past the middle, 3 to 5 from the end of the median, 4 much closer to 3 than to 5.

S. antigone Strk.

1879—Strk., Rept. Chief Eng., 1878–79, V., p. 1860, *Spilosoma.*
1883—Grt., CAN. ENT., XV, 9, *= congrua.*
1886—Hulst., Ent. Amer., II., 162, *= congrua.*
1889—Smith, Ent. Amer., V., 121, *an sp. dist. congrua.*

S. congrua ‡ Grt.

1883—Grt., CAN. ENT., XV., 9, *Spilosoma.*
1886—Hulst*, Ent. Amer., II., 15, *Spilosoma.*
1889—Soule & Elliot*, Psyche, V., 259, life hist.

Habitat—Mass., N. Y., Ga., Colorado.

My reasons for this synonomy are given in Ent. Amer., V., 121. Walker's description does not apply to *antigone* at all, while it does apply to *cunea*, a specimen of which, according to Butler, was of the "types."

S. latipennis Stretch.

1872—Stretch, Zyg. & Bomb., 133, pl. 6, f. 5, ♀, *Spilosoma.*

1874—Lint., Ent. Cont., III., 144, *Spilosoma.*

1883—Edw.*, Papilio, III., 190, *Spilosoma.*

1884—Hulst*, Bull. Bkln. Ent. Soc., VII., 120, *Spilosoma.*

Habitat—Buffalo, Albany and L. I., N. Y.; Mass., N. J.

This species seems to favor damp, almost swampy meadows. I have taken specimens in such localities very sparingly.

S. niobe Strk.

1884—Strk., Proc. Ac. Nat. Sci., Phil., XXXVI., 284, *Spilosoma.*

Habitat—Florida.

This species I do not know at all.

S. prima Slosson.

1889—Slosson, Ent. Amer., V., 40, *Spilosoma.*

Habitat—Franconia N. H., June.

Mrs. Slosson's captures at this locality indicate that there is a great deal yet to be done by the thorough collector in the mountainous parts of New England.

S. vestalis Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 125, *Spilosoma.*

1872—Stretch, Zyg. & Bomb., 133, pl. 6, ff. 7 (♂) and 8 (♀) *Spilosoma.*

1876—Edw.*, Proc. Cal. Ac. Sci., VII., 22, *Spilosoma.*

Habitat—California.

Food plant—*Lupinus* sp.

S. virginica Fabr.

1798—Fabr., Ent. Syst. Suppl., 437, *Bombyx.*

1833—Harris, Cat. Ins. Mass., 591, *Arctia.*

1841—Harris*, Rept. Ins. Mass., 248, *Arctia.*

1856—Wlk., C. B. Mus. Lep. Het., III., 668, *Spilosoma.*

1857—Fitch, 3rd Rept. Ins., N. Y., *Spilosoma.*

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 531, *Spilosoma.*

1862—Morris*, Synopsis, Supplt., 342, *Spilosoma.*

1862—Harris*, Inj. Insects, 350, ff. 167–168, *Arctia.*

1862—Morris in note to Harris, l. c., *Spilosoma.*

1863—Saunders, Syn. Can. Arct., 14, *Spilosoma.*

1871—Riley*, 3rd Rept. Ins. Mo., 68, f. 28, *Spilosoma.*

1871—Riley*, Am. Ent., II., 272, f. 170, *Spilosoma.*
1872—Stretch*, Zyg. & Bomb., 131, pl. 6, f. 6, *Spilosoma.*
1873—Edw., Proc. Cal. Ac. Sci., V., 187, *Spilosoma.*
1878—Lint.*, Ent. Cont., IV., 143, *Spilosoma.*
1880—Saund.*, Can. Ent., XII., 56, f. 9, *Spilosoma.*
1883—Saund.*, Fruit Insects, 271, f. 281, *Spilosoma.*
1884—Bean*, Papilio, IV., 66, *Spilosoma.*
1887—Bruce*, Ent. Amer., III., 140, *Spilosoma.*
1888—Dimmock, A. K., Psyche, IV., 281, *Spilosoma.*
Habitat—U. S. generally, Canada, Nova Scotia, H. B. Terr.

This species is the most widely distributed of the genus; its bibliography is very much more extensive than above given, if the economic literature be taken into account. The larva is omnivorous.

Genus Hyphantria Harris.

1841—Harris, Rept. Ins. Mass., 255.
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 530.
1862—Harris, Inj. Insects, 358.
1873—Stretch, Zyg. & Bomb., 204.
1876—Moeschl., Stett. Ent. Zeit., XXXVII., 297.

Head small; tongue weak and short; palpi mere rudiments. Antennæ moderate in length, shorter and simple in the female, bipectinated in the male. Legs short and rather slender. Spurs of middle tibiæ very short and weak; posterior tibiæ with small terminal spurs only; anterior tibiæ with a small spine each side of tip. Claws simple.

Primaries with 7 to 10 on a stalk, 10 very close to the base of the stalk; 7, 8 and 9 close together near the apex; 3, 4 and 5 from the end of the median; 4 and 5 from the same point, or on a short stalk, 3 very close to 4.

Secondaries, 8 from subcostal past the middle; 6 and 7 on a long stalk from end of subcostal; 4 and 5 from the same point from end of median; 3 somewhat remote from 4.

Despite its superficial resemblance to *Spilosoma* this is really a strongly marked genus.

H. cunea Dru.
1770—Drury, Ex. I., XVIII., f. 4, *Bombyx.*
1816—Hübn., Verzeichniss, 184, *Cycnia.*

1825—Hübn., Zutraege, 203, ff. 405, 406, *Cycnia.*
1837—Westw., ed. Dru., I., 34, *Spilosoma.*
1856—Wlk., C. B. Mus., Lep. Het., III., 669, *Spilosoma.*
1856—Fitch.*, 3rd Rept. Ins., N.Y., 384, *Hyphantria.*
1860—Clem , Proc. Ac. Nat. Sci., Phil., XII., 531, *Hyphantria.*
1862—Clem., in Morris Syn., 352, *Hyphantria.*
1862—Morris, Synopsis, 343, *Spilosoma.*
1865—Wlk., C. B. Mus., Lep. Het., XXXII., 352, *Hyphantria.*
1873—Stretch*, Zyg. & Bomb., 205, pl. VIII., ff. 18-20, *Hyphantria.*
1875—Butler, Cist. Ent., II., 32, *Hyphantria.*
1881—Graef., Bull. Bkln. Ent. Soc., III., 14, *Spilosoma.*
1881—French, Bull. Bkln. Ent. Soc., III., 31, *Spilosoma.*
1887—Riley*, Bull. X., Div. Ent., U. S. Dept. Agl., *Hyphantria.*

H. punctatissima A. & S.

1797—Abb. & Sm.*, Ins. Ga., II., 139, pl. 70, *Phalæna.*
1825—Hübner, Zutraege, 203, *pr. syn.*
1837—Westw., ed. Drury, I., 34, *pr. syn.*
1841—Harris*, Rept. Ins., Mass., 255, *Hyphantria.*
1862—Harris*, Inj. Ins., 358, *Hyphantria.*
1862—Morris, note to Harris, l.c., *pr. syn.*
1871—Saund.*, CAN. ENT., III., 36, *Hyphantria.*
1881—Graef., Bull. Bkln., Ent. Soc., III., 14, *pr. syn.*

H. congrua Wlk.

1856—Wlk., C. B. Mus., Het., III., 669, *Spilosoma.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 532, *Spilosoma.*
1862—Morris, Synopsis, Supplt., 343, *Spilosoma.*
1868—Grt. & Rob., Trans. Am. Ent. Soc., II., 72, *Spilosoma.*
1873—Stretch, Zyg. & Bomb., 130, *Spilosoma.*
1875—Butler, Cist. Ent., II., 33, =*cunea.*
1883—Grt.‡, CAN. ENT., XV., 9, *Spilosoma.*
1889—Smith, Ent. Amer., V., 121, =*cunea.*

H. punctata Fitch.

1856—Fitch, 3rd Rept. Ins., N. Y., 387, *Hyphantria.*
1862—Morris, Synopsis, Supplt., 344, *Spilosoma.*
1874—Stretch, Zyg. & Bomb., 204, *Hyphantria.*
1875—Butler, Cist. Ent., II., 33, *pr. syn.*

1881—Graef, Bull. Bkln. Ent. Soc., III., 14, *pr. syn.*
1881—French, Bull. Bkln. Ent. Soc., III., 31, *pr. syn.*

H. textor Harris.

1828—Harris*, New Engl. Farmer, VII., 33, *Arctia.*
1833—Harris, Cat. Ins. Mass., 591, *Arctia.*
1841—Harris*, Rept. Ins. Mass., 255, *Hyphantria.*
1856—Fitch*, 3rd Rept. Ins., N. Y., 387, *Hyphantria.*
1856—Wlk., C. B. Mus., Lep. Het., IV., 834, *Euproctis.*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 530, *Hyphantria.*
1862—Morris, Synopsis Supplt., 344, *Spilosoma.*
1862—Harris*, Inj. Ins., 358, pl. VII., ff. 10–12, *Hyphantria.*
1862—Morris, in Harris l. c. note, *Spilosoma.*
1865—Walk., C. B. Mus., Lep. Het., XXXII., 351, *Hypantria.*
1870—Riley*, Am. Ent., I., 59, *Hyphantria.*
1871—Riley*, 3rd Rept. Ins., Mo., 130, f. 55, *Hyphantria.*
1871—Walsh*, 2nd Rept. Ins., Ills., 18, *Hyphantria.*
1871—Saund.*, Can. Ent., III., 69, *Hyphantria.*
1873—Stretch*, Zyg. & Bomb., 206, pl. VIII., f. 21 (♂), *Hyphantria.*
1875—Edw.*, Proc. Cal. Ac. Sci., VI., 187, *Hyphantria.*
1875—Butler, Cist. Ent., II., 33, *Hyphantria.*
1881—Johnson*, Can. Ent., XII., 18, *Hyphantria.*
1881—Graef, Bull. Bkln. Ent. Soc., III., 14, =*cunea.*
1881—French, Bull. Bkln. Ent. Soc., III., 31, =*cunea.*
1881—Riley, Gen. Index to Mo. Reports, 55, =*cunea.*
1883—Saund.*, Fruit Insects, 71, ff. 66–68, *Hyphantria.*
1888—Dimmock*, A. K., Psyche, IV., 280, *Hyphantria.*

H. candida Wlk.

1864—Wlk., C. B. Mus., Lep. Het., XXXI., 291, *Spilosoma.*
1868—Grt. & Rob., Trans. Am. Ent. Soc., II., 84, *pr. syn.*
1875—Butler, Cist. Ent., II., 33, *an sp. dist?*
Habitat—United States and Canada.

An elaborate list of food plants is given in Bull. X. of the Division of Entomology, U. S. Dept. of Agriculture, to which reference is made above. The synonymy is the generally accepted one, except as to *congrua*, which is added for the first time. In Mr. Grote's list of 1882, *textor* and *punctata* stand without number but in Roman letters, and therefore not as synonyms. There is no doubt at all of the identity of all

these forms. Prof. Riley has proved that to demonstration, if proof were required to the statements of earlier writers.

Genus Eupseudosoma Grt.

1865—Grt., Proc. Ent. Soc., Phil., 240.

This genus I do not know autoptically. Mr. Grote, describing a male, gives the character, from which the following notes are made: Body stout; finely scaled, squammation close and short; head prominent, eyes large; tongue moderate, palpi finely scaled, not exceeding the front; legs rather stout, finely scaled, provided with minute spurs; antennæ long, biserrate, tapering to the tips, the serrations short, acute and rather distant; primaries large, triangulate, apices produced, costa very straight, external margin oblique; discal cell open; veins 3, 4 and 5 very nearly from one point, 2 not greatly removed from 3.

Unfortunately, Mr. Grote does not describe the arrangement of the costal series, but it is probably not different from *Spilosoma*. The venation of the secondaries is not described. Our only described species is: *E. floridum* Grt.

1882—Grt., Can. Ent., XIV., 187, *Eupseudosoma*.

Habitat—Florida.

Said to be closely allied to the Cuban *E. niveum*.

Genus Euchaetes Harris.

1841—Harris, Rept. Ins., Mass., 257.
1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 532.
1862—Harris, Inj. Insects, 360.
1873—Stretch, Zyg. & Bomb., 185, *syn. spec.*
1882—Grt., Can. Ent., XIV., 196, *syn. spec.*

Pygarctia Grt.

1871—Grt., Can. Ent., III., 124.

Head moderate or rather large, closely applied to the thorax; eyes large, but not prominent. Palpi slender, not exceeding the middle of the front; third joint moderate. Tongue long, corneous. Antennæ long, in the ♂ rather lengthily bipectinated. Legs with rather close vestiture, posterior but little the longer, spurs normal. Vestiture hairy, but rather close. Abdomen exceeding secondaries, cylindric, obtusely terminated.

Primaries with 10 out of the subcostal before the end, 7 to 9 on the

same stalk, 8 and 9 dividing just before the apex; 6 out of the same point with the stalk bearing 7–9; 3, 4 and 5 close together from the end of the median.

Secondaries: Subcostal rather long, forking to give rise to 6 and 7 unusually close to apex; costal very short from the subcostal beyond its middle; 3, 4 and 5 very close together out of the end of the median.

These studies were made on *E. egle*. In Mr. Grote's paper on the genus in CAN. ENT., XIV., 196, is an excellent table of the species at that time known, which renders their recognition easy. Several have been since described. From what we know of the early history of some of the species, dimorphism occurs in the genus, and some of the described forms may yet prove synonyms.

E. abdominalis Grt.

1871—Grt., CAN. ENT., III., 124, *Pygarctia*.
1873—Grt., Buff. Bull., I., 34, *Pygarctia*.
1882—Grt., Papilio, II., 111, *Euchaetes*.
1882—Grt., CAN. ENT., XIV., 196, *Euchaetes*.
Habitat—Alabama.

E. bolteri Stretch.

1885—Stretch, Ent. Amer., I., 106, *Euchaetes*.
Habitat—Texas.

E. collaris Fitch.

1856—Fitch, 3rd Rept. Ins., N. Y., 265, *Hyphantria*.
1862—Morris, Synopsis, 344, *Spilosoma*.
1864—Pack., Proc. Ent. Soc., Phil., III., 130, =*egle*.
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 75, =*egle*.
1873—Stretch, Zyg. & Bomb., 188, pl. 8, f. 5 ♂, *Euchaetes*.
1874—Lint.*, Ent. Cont., III., 146, *Euchaetes*.
1877—Van. Wag.*, CAN. ENT., IX., 171, *life hist.*
1880—Jewett*, CAN. ENT., XII., 228, *Euchaetes*.
1882—Grt., CAN. ENT., XIV., 196, *Euchaetes*.
1883—Edw.*, Papilio, III., 146, *Euchaetes*.

E. antica Wlk.

1857—Wlk., C. B. Mus., Lep. Het., VII., 1745, *Tanada*.
1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 75, =*egle*.
1873—Stretch, Zyg. & Bomb., 188, *pr. syn.*
1875—Butler, Cist. Ent., II., 37, *pr. syn.*

E. sciurus Bdv.

1868—Bdv., Lep. Calif. (Ann. Soc. Ent., Belg., XII.), 79, *Arctia.*
1869—Grt. & Rob., Tr. Am. Ent. Soc., III., 174, =*L. acræa.*
1873—Stretch, Zyg. & Bomb., 188, =*collaris.*
1875—Butler, Cist. Ent., II., 37, =*collaris.*
Habitat—Canada, New York, Ohio, California.
Food plant—Apocynum androsæmifolium, and Asclepias sp.

E. egle Drury.

1773—Dru., Exot. II., pl. XX., f. 3, *Bombyx.*
1837—Westw., ed. Drury, II., 38, *Spilosoma.*
1841—Harris*, Rept. Ins., Mass., 257, *Euchaetes.*
1856—Wlk., C. B. Mus., Lep. Het., III., 669, *Spilosoma.*
1860—Clem., Pr. Ac. Nat. Sci., Phil., XII., 352, *Euchaetes.*
1862—Harris*, Inj. Ins., 359, ff. 172–174, *life hist.*
1862—Morris, Synopsis, 343, *Spilosoma.*
1862—Clem., in App. to Morris, 352, *Euchaetes.*
1869—Harris*, Ent. Corresp., 288, pl. 2, f. 5, (larva), *Euchaetes.*
1872—Strk., Lep. Rhop. et. Het., I., 3, *Euchaetes.*
1872—Lint.*, Ent. Cont., II., 136, *Euchaetes.*
1873—Stretch, Zyg. & Bomb., 186, pl. 8, f. 4, *Euchaetes.*
1874—Pack., Rept. Geol. Surv., 1874, 558, *Euchaetes.*
1880—Andrews*, Psyche II., 271, *Euchaetes.*
1880—Jewett, Can. Ent., XII., 230, *life hist.*
1882—Grt., Can. Ent., XIV., 196, *Euchaetes.*
1883—Hy. Edw.*, Papilio, III., 147, *Euchaetes.*
1884—French*, Can. Ent., XVI., 221, *Euchaetes.*
Habitat—New York, New Jersey, Mass., Maine, Ills., Colorado, Canada.
Food plant—Asclepias cornutus, etc.

E. eglenensis Clem.

1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 533, *Euchaetes.*
1875—Butler, Cist. Ent., II., 37, ? =*egle.*
1882—Grt., Can. Ent., XIV., 196, *Euchaetes.*
1882—Grt., Papilio, II., 111, *Euchaetes.*
1883—Hy. Edw.*, Papilio, III., 147, *Euchaetes.*
Habitat—Texas.
Food plant—Asclepias sp.

(To be continued.)

A MONTH ON VANCOUVER ISLAND.

BY H. F. WICKHAM, IOWA CITY, IOWA.

But little seems to have been written on the fauna of this interesting island, and therefore I hope that a few notes bearing on the subject may not be without interest to the readers of the CANADIAN ENTOMOLOGIST. It was my good fortune to spend nearly a month in the vicinity of Victoria last summer, and I append some account of observations made at the time.

The Cicindelidæ are represented only by two species of *Omus* and by *Cicindela oregona*, the latter flying on the beach. *Omus audouinii* also frequents the beach, hiding under logs high enough up to be out of the the way of the water, while *O. dejeanii* dwells in the woods, and may be found under damp logs.

Two species of *Cychrus*—*angusticollis* and *marginatus*—are found in the heavy forest, and may be dug out of very rotten logs, or found in hollow roots of trees. They both seem to be rather common in places, as I dug over fifty *angusticollis* and a number of *marginatus* out of a single log. The former species emits a very strong and unpleasant odor when disturbed by handling.

Carabus oregonensis seems to prefer rather more open spots, and I took it mostly in the lanes around the outskirts of the town. These specimens are larger than those from Oregon and Washington, and have lighter colored elytra—resembling a specimen shown to me as coming from Sitka. Many other Carabidæ are common, especially *Blethisa*, *Notiophilus*, *Leistus*, *Nebria* and *Bembidium*.

Seashore collecting yields a rich return here, and nearly every log thrown up by the waves out of reach of the tides has its colony of beetles underneath. They are of various species and represent nearly all the large families, though, perhaps, Staphylinidæ are the most abundant. The large *Hadrotes crassus* may be seen under any log or bunch of kelp, which is damp enough to suit. Then we see *Cafius* represented by three species and numerous specimens of a little *Aleochara*, these living mostly in seaweed, along with *Cercyon fimbriatum*, a widely distributed species which I found in plenty at San Diego. The little Trichopterygid with the formidable name—*Motschulskium sinuatocolle*—may be seen on the under surface of logs on the beach, and the omnipresent *Dermestes* looks out for whatever the sea may give up of its dead.

Occasionally a good *Elaterid* is found. I got my only specimen of

Corymbites carbo on the beach, and in dead wood *Hadrobregmus gibbicollis* makes its burrows. The curious little Malachiid known as *Endeodes collaris* runs on the salt sand, and an occasional *Ceruchus* may be seen under the drift.

I found no maritime Chrysomelids, but the Tenebrionidæ furnish an *Eleodes* and a *Coniontis* together with an occasional *Phaleria*. *Anthicidæ* were rare here, though common further south, but in the Rhyncophora some very interesting species were found.

In this group I found *Agasphærops nigra* and *Amnesia decorata* both on the beach, and once came across a little colony of *Emphyastes fucicola*, one of the most curious looking weevils I have ever seen. The testaceous color of this species seems to be shared by a great many others, which are strictly confined to a life on the beach. *Elassoptes marinus* is common under logs, boring in them from the lower surface, in company with a species of *Rhyncholus*.

Just back of the beach, near the park, is a nearly level space overgrown with various plants, a large majority of which are leguminous, and in the pods of these breed *Apion antennatum* and a species of *Bruchus*. With a sweep net vast numbers of these may be taken, along with numerous individuals of a species of *Ceutorhynchus*. In the lanes the sweep net may be used to great advantage, and some good species are certain to be taken—mostly Elateridæ in June, the month in which my work was done. These Elaterids form one of the most striking features in the fauna of the island, and are numerous both in species and individuals. *Corymbites* and *Athous* seemed the most plentiful of the larger forms, while *Dolopius* and *Megapenthes* represented the smaller.

Serica anthracina and *Odontæus obesus* were the only Scarabæids of note that I found, and these both, but rarely *Lepturæ* were the commonest longhorns, though a few others came to hand in beating: *Eumichthus œdipus* on flowers, *Molorchus longicollis* and *Xylotrechus annosus* on willows.

Chysomelidæ are also rather backward in showing themselves. I took only one *Donacia* by careful search, and the only Cryptocephalids seem to be *Diachus auratus* and *D. catarius*. I took *D. auratus* in the mountains of Arizona in 1888 and have *D. catarius* from Michigan, so these forms are both very widely distributed. *Plagiodera oviformis* occurs on low ground with *Prasocuris vittata* and the familiar green of *Crepidodera helxines* shines on the willows.

In the meadows I found a few specimens of *Epicauta puncticollis*, but that was all I saw of the Meloidæ. We could hardly expect to find many of them so far north however.

Having a love for Rhyncophora I took pains to get as large a series as possible, and was rewarded by finding quite a number of species. *Rhynchites bicolor* lives on roses there, as I believe it does everywhere in North America, in fact I doubt if there is a spot on this continent where roses grow, that *Rhynchites bicolor* does not inhabit too. Besides *A. nigra* and *A. decorata* previously mentioned, other species of Otiorhynchids may be found, and of these *Amnesia granicollis* and *Sciopithes obscurus* are the most plentiful. The former is found in moss or around the roots of grass under logs, while the latter lives on various bushes, preferring blackberry, I think. In company with the *Amnesia* may be found large numbers of a species of *Sitones*, which may some day require the attention of the economist. The injury done to the roots of grass by this little beetle must, I think, be considerable.

I took one *Plinthodes taeniatus* from a rotten log, and two or three *Trichalophus didymus* on low ground among a lot of willows. *Apion* has already been spoken of, *Lepyrus* is common on willow with *Dorytomus brevicollis*, *D. mannerheimii*, *Magdalis salicis* and *Orchestes niger*.

Sweeping in a field yielded a fine specimen of *Trachodes quadrituberculatus*, one of *Phytonomus setigerus* and two or three of a new *Anthonomus*. *Ceutorhynchus* furnished two or three species, *Pelenomus* one, and *Phytobius* one, probably *P. velatus* Beck, a very interesting species of wide distribution, occurring in Michigan and Illinois as well as in Europe. I found no signs of *Centrini* and no *Sphenophorus*. The Scolytidæ taken were all of two species—*Scolytus unispinosus* and *Hylesinus aspericollis*.

There seems to be a preference among water-beetles for small bodies of water, and often after sifting the waters at the edge of a lake or stream with little or no success, I have thoroughly cleaned out a little spring or puddle and found it swarming with them. This experience, repeated so often before, was gone through again at Victoria and I made quite a collection of aquatics in the course of a couple of hours. The species were few in number—not over twenty probably—but there were a good many examples of some of them. The genera *Bidessus*, *Deronectes*, *Agabus*, *Dytiscus*, *Helophorus*, and *Hydrobius* hold the bulk of the species.

Before closing I wish to speak of the results of sifting, a method of collecting which is sadly neglected by many collectors, but which yields some of the rarest and most interesting species. I had expected a good deal of material to result from the use of the sieve here and was not disappointed. Putting in a good-sized bundle of moss and rubbish I shake it over a white cloth and out tumble the beetles faster than I can take care of them—little Staphylinidæ in abundance, now and then a *Tychus cognatus* or *Batrisus zephyrinus*, dozens of *Cyphon exiguus* and single specimens of various kinds. Once in a while some weevil falls out or a *Simplocaria*, *Bembidium* is racing around the cloth, and so are the little —almost invisible—Trichopterygidæ, in which the fauna of the Island is rich. Many Latridiidæ also fall through the wires.

I would recommend this Island as a fine field for investigation by any Entomologist who wishes to spend his summer in a spot charming in itself and rich in insect life. While the fauna of the Island is in some degree marked by one of the peculiarities of the Pacific coast—i. e. a less number of species occupying a given small area than is the case in the East—there are enough to keep one always happy by finding something new or of interest, and material from this region is in good demand among students of our North American fauna, therefore duplicates find a ready exchange. My own work was done mostly in the Coleoptera, but insects of other orders seemed to be plentiful, with the exception of Lepidoptera. There may be more of these however at other seasons of the year.

THE ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO

will be held in the rooms of the Society, at London, on Wednesday, August 27th, at 9.30 a. m.

THE ENTOMOLOGICAL CLUB OF THE A. A. A. S.

will meet in a room to be assigned by the local committee in the Capitol building at Indianapolis, Indiana, Wednesday, August 20th, at 9 a.m., when members will register and obtain the Club badge. Members intending to contribute papers will send the titles to the President, Prof. A. J. Cook, Agricultural College, Michigan, or F. M. Webster, Lafayette, Ind. It is to be hoped that members will contribute freely, not only to the proceedings of the Club, but also to those of Section " F ".

F. M. WEBSTER, Sec. Ent. Club A. A. A. S.

Mailed August 6th.

The Canadian Entomologist.

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A SUGGESTION AS TO THE GENERIC NOMENCLATURE OF INSECTS.

BY T. D. A. COCKERELL, LONDON, ENGLAND.

Mr. Scudder's recent admirable work on the butterflies of New England has, naturally enough, given rise to fresh discussion of the question of generic nomenclature, without, however, leading to any very decisive result. Mr. Scudder's views on the sub-division of hitherto-accepted generic units are certainly extreme, and probably few will be found to follow him entirely. On the other hand, many no doubt feel that Mr. W. H. Edwards's genera require some sort of sub-division, and would compromise matters by admitting some, and rejecting others, of Mr. Scudder's divisions. Mr. Edwards himself, in his 1884 catalogue, has numbered sub-divisions of many larger genera; thus of *Lycæna* we get groups I. to VII. But these numbers are not adopted by others, partly because different authors treat the subject differently, thus creating confusion, and partly because it is not easy or convenient to use a number instead of a name.

So we come to this conclusion: It is necessary that the larger genera should be sub-divided, but it is highly unadvisable to call all those sub-divisions genera. We therefore need a system of section or group-names which shall be uniform, used generally,—not, like the numbers, variable according to the fancy of the author,—and yet not of the nature of genera or sub-genera.

In the treatment of *Carex* by the botanists I think we see a similar problem solved. *Carex* is a huge genus, which even after a reasonable amount of subgeneric division, needs further grouping to be made intelligible. So, Fries, Drejer, Tuckerman and others have proposed section-names: *Flexiles*, *Paniceæ*, *Sigitatæ*, etc. These names are always in the plural, and have nothing to do with sub-genera or genera properly speaking, nor does any trouble arise about priority, provided the name has not been used before in the same genus. The groups may not

be all of equal value, and there are sections again sub-divided into sections. This system is not new, and I believe it to be very useful, allowing us to recognize the natural sub-divisions of genera, without being obliged to make genera of them. I have already adopted these section-names in a list of North American land-shells now ready for printing, and have thereby been able to reduce the number of so-called sub-genera without refusing to notice the natural groups they represent. I derived my section-names when convenient from a prominent species of the group, or in other cases, by adopting a descriptive term, or turning a sub-generic name into a plural section-name.

Before writing this paper, I wrote to Mr. W. H. Edwards, telling him of my idea for getting out of the present difficulty. He comments favourably on the suggestion, and writing of Mr. Scudder's "genera," made by sub-division of *Colias*, etc., he says: "I consider them groups merely, or sub-groups. All *Anthocharis*, I think, should be one [genus], all *Argynnis* one, all *Colias* one. If numbers can't be accepted, I am perfectly willing to try the section-names as you suggest * * *. By-and-by I propose to give a new edition of my catalogue, and then I may adopt the plan throughout. It would save us from fifty genera in *Pamphila* at once." *(in litt.*, May 17, 1890.)

Should Mr. Edwards decide to adopt section-names, we can hardly do better than leave him to decide about the sections and choose appropriate names; but to illustrate the point I will here treat a few "genera" as proposed:—

W. H. Edwards.	Scudder.	Proposed Section-Name.
Papilio, group V.	Jasoniades.	Turni.
Colias, group I.	Zerene.	Cæsoniæ.
Vanessa, pars.	Euvanessa.	Antiopæ.
Pamphila, group II., pars.	Erynnis.	Erynnes.
Thecla, group IV., pars.	Incisalia.	Incisaliæ.
Lycæna, group V.	Rusticus.	Rustici.
Chrysophanus, group III.	Heodes.	Chrysophanuli.

As will be seen, the first three names are taken from prominent species; the second three from the so-called genera, and the last from a character of the group. It may be found advisable, at least as often as possible, to adopt the name from a species; but some specific names, as *powcschick*, *pawnee*, etc., would be rather difficult to render plural, not to

speak of the objection to increasing the use (as section-names) of such extraordinary appellations. The plural termination, I should think, ought always to be Latinised.

The same principle may, of course, be applied to other groups of insects. Such genera as *Agrotis*, *Pterostichus*, *Tipula*, *Bombus*, etc., might be well sectionised.

PRELIMINARY CATALOGUE OF THE ARCTIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 168, Volume xxii.)

E. elegans Str.

1873—Stretch, Zyg. & Bomb., 189, pl. 8, f. 6, *Euchaetes.*

1875—Butler, Cist. Ent., II., 37, *Euchaetes.*

1876—Stretch, Wheeler's Rept. Surv., west 100 mer., V., 797, pl. 40, ff. 5 and 6, *Euchaetes.*

1882—Grt., CAN. ENT., XIV., 196, *Euchaetes.*

Habitat—California, Owens Valley.

E. immaculata Graef.

1887—Graef., Ent. Amer., III., 42, *Euchaetes.*

Habitat—Florida.

E. inopinatus Hy. Edw.

1882—Edw., Papilio, II., 13, *Euchaetes.*

Habitat—Florida.

E. murina Stretch.

1885—Stretch, Ent. Amer., I., 106, *Euchaetes.*

1887—Graef., Ent. Amer., III., 142, *Euchaetes.*

Habitat—Arizona, Texas.

E. oregonensis Stretch.

1873—Stretch, Zyg. & Bomb., 187, pl. 8, f. 7, *Euchaetes.*

1874—Lint.*, Ent. Cont., III., 145, *Euchaetes.*

Habitat—Oregon, Texas, New York.

E. perlevis Grt.

1882—Grt., CAN. ENT., XIV., 196, *Euchaetes.*

1882—Grt., Papilio, II., 131, *Euchaetes.*

Habitat—Arizona.

E. pudens Hy. Edw.
1882—Edw., Papilio, II., 126, *Euchaetes.*
1882—Grt., Can. Ent., XIV., 196, *Euchaetes.*
Habitat—Texas.

E. scepsiformis Graef.
1887—Graef, Ent. Amer., III., 43, *Euchaetes.*
Habitat—Texas.

E. spraguei Grt.
1875—Grt., Can. Ent., VII., 200, *Euchaetes.*
1877—Grt., Can. Ent., IX., 85, *Euchaetes.*
1882—Grt., Papilio, II., 111, *Euchaetes.*
1882—Grt., Can. Ent., XIV., 196, *Euchaetes.*
Habitat—Kansas, Texas.

E. vivida Grt.
1882—Grt., Papilio, II., 131, *Euchaetes.*
1882—Grt., Can. Ent., XIV., 196, *Euchaetes.*
Habitat—South-western Texas.

E. yosemite Hy. Edw.
1883—Edw., Papilio, III., 146, *Euchaetes.*
Habitat—San Jose Valley, California.

E. zonalis Grt.
1882—Grt., Papilio, II., 131, *Euchaetes.*
1882—Grt., Can. Ent., XIV., 196, *Euchaetes.*
Habitat—Arizona.

The genus *Vanessodes* G. & R., which Mr. Grote inserts in this place seems to be a *Lithosian.* I cannot demonstrate ocelli in any specimens I have examined. The venation and habitus is also Lithosiform rather than *Arctiid.*

Genus Arachnis Hbn.

1837—Hübner, Zutræge, 457.
1873—Stretch, Zyg. & Bomb., 83.

Head very small, retracted; palpi small; tongue short and weak, not longer than the head. Legs short and stout; tibiæ with the spurs normal in number, but very short.

Primaries with 7 to 10 on a stalk, 10 branching a very short distance from the end of the subcostal, 7 to 9 branching rather beyond the middle of the common vein ; 3, 4 and 5 almost equidistant from the end of the median.

Secondaries with 6 and 7 forking from the subcostal slightly before the end of the cell ; 3, 4 and 5 very close together from the end of the median.

The antennæ are simple in both sexes, and the tarsal claws are also simple.

A. picta Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 126, *Arachnis.*
1873—Stretch*, Zyg. & Bomb., 83, pl. 3, f. 6, ? = *aulæa.*
1876—Moeschl., Stett. Ent. Zeit., XXXVII., 298, *Arachnis.*
Habitat—California, Colorado.
Food plant—Lupinus sp.

A. aulæa Geyer.

1837—Geyer, Zutraege, 913, 914, *Arachnis.*
1860—Clem , Proc. Ac. N. Sci., Phil., XII., 526, *Arachnis.*
1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 78, *Ecpantheria.*
1873—Stretch, Zyg. & Bomb., 86, *Arachnis.*
1876—Moeschler, Stett. Ent. Zeit., XXXVII., 298, *Arachnis.*
incarnata Wlk.
1855—Wlk., C. B. Mus., Lep. Het., III., 690, *Ecpantheria.*
1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 524, *Ecpantheria.*
1865—Wlk., C. B. Mus., Lep. Het., XXXI., 300, *pr. syn.*
Habitat—California, Mexico.

Whether we have here to do with one or two species is a question ? Packard, in describing his species, does not refer to *aulæa* at all. Moeschler says the difference between the two is that in *picta* the costal margin of primaries beneath is yellow, whereas in *aulæa* it is red. Whether or not the Mexican form is different from the Californian examples must be settled by those who have the material. All the California specimens I have ever seen refer to the *picta* variety.

Genus Euerythra Harv.

1876—Can. Ent., VIII., 5.
1887—Smith, Proc. U. S. Nat. Mus., X., 335.

Head moderate in size, scarcely retracted; tongue weak; palpi small, longer in the ♀. Antennæ of ♂ bipectinated, of the ♀ simple. Legs almost equal in length, spurs normal in number but short.

Primaries with 7 to 10 stalked, out of the same point with 6 from the end of the subcostal; 3, 4 and 5 from the end of the median, 4 more remote from 3 than from 5.

Secondaries without costal vein, subcostal extended some little distance beyond the end of the cell and forking to give off 6 and 7; 3, 4 and 5 from the end of the median, 5 rather more remote from 4 than is 3.

For further details I would refer the student to my paper in Proc. U. S. Nat. Mus., X., 335.

E. phasma Harv.

1876—Harv., Can. Ent., VIII., 5, *Euerythra.*

1887—Smith, Proc. U. S. Nat. Mus., X., 336, *Euerythra.*

Habitat—Texas.

E. trimaculata Smith.

1887—Smith, Ent. Amer., III., 17, *Euerythra.*

1887—Smith, Proc. U. S. Nat. Mus., X., 336, *Euerythra.*

Habitat—Texas.

The two species are closely allied, but are, I believe, distinct.

Genus Ecpantheria Hbn.

1816—Hübner, Verzeichniss, 183.

1855—Walker, C. B. Mus., Lep. Het., III., 668..

1862—Morris, Synopsis, 347.

1873—Stretch, Zyg. & Bomb., 174.

Tongue very short and weak. Legs short and stout, subequal in length; middle and posterior tibiæ with minute terminal spurs only. Tarsi short, the claws split nearly to the base in both sexes. Antennæ of the male serrate, of the female simple.

Primaries with 6 to 10 stalked out of the end of the subcostal, 6 branching off almost immediately, 10 a little further on, 7 more than half way to apex, while 8 and 9 divide just before the apex; 3, 4 and 5 from the end of the median, 4 nearer to 5 than to 3.

Secondaries with 8 from the subcostal unusually close to base; 6 and

7 from the same point at the end of the subcostal : 4 and 5 from the same point at end of median, 3 very close to the same source.

The wing form of the genera has not been described very generally in these notes, but in this genus it may be added that the secondaries are disproportionately small and tend to become caudate.

E. permaculata Pack.

1872—Pack., 4th Rept. Peab. Ac. Sci., 86, *Leucarctia.*
reducta Grt.
1877—Grt., Bull. U. S. Geol. Surv., III., 799, *Ecpantheria.*
1887—Bruce, Ent. Amer., III., 14, *Ecpantheria.*
cæca Strk.
1884—Strk., Proc. Ac. Nat. Sci., Phil., XXXVI., 283, *Ecpantheria.*
Habitat—Colorado, Arizona, So. California.

Dr. Packard's term *permaculata* seems to have become lost in some way. It is not referred to in Mr. Grote's list, and Mr. Edwards does not mention it in his additions in Ent. Amer., III. It refers without doubt to the *reducta* of Grote. Mr. Bruce has taken it quite abundantly in Colorado.

E. scribonia Stoll.

1787—Stoll*, Sup. to Cramer's Pap. Ex., f. 177, pl. 41, f. 3, *Phalæna.*
1816—Hbn., Verzeichniss, 183, *Ecpantheria.*
1825—Hbn., Samml. Ex. Schmett., pl. 403, *Ecpantheria.*
1855—Wlk., C. B. Mus., Lep. Het., III., 689, *Ecpantheria.*
1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 523, *Ecpantheria*
1862—Harris*, Injurious Insects, 349, *Ecpantheria.*
1862—Clem., App. to Morris, Syn., 347, *Ecpantheria.*
1863—Saund.*, Proc. Ent. Soc., Phil., II., 28, *Ecpantheria.*
1863—Saund.*, Syn. Can. Arct., 22, *Ecpantheria.*
1864—Pack., Proc. Ent. Soc, Phil., III., 127, *Ecpantheria.*
1868—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 78, *Ecpantheria.*
1872—Riley*, 4th Rept. Ins. Mo., 141, ff. 63, 64, *Ecpantheria.*
1873—Stretch*, Zyg. & Bomb., 174, pl. 7, ff. 20 (♂) and 21 (♀), *Ecpantheria.*
1882—Saund*, Can. Ent., XIV., 113, f. 12 and 13, *Ecpantheria.*
1888—Slosson, Ent. Amer., III., 185, *Ecpantheria.*
oculana Fabr.

1775—Fabr., Syst. Ent., 564, *Bombyx*.
1781—Fabr., Sp. Ins., II., 177, *Bombyx*.
1787—Fabr., Mant. Ins., II., 112, *Bombyx*.
1791—Oliv., Enc. Meth., V., 44, *Bombyx*.
1793—Fabr., Ent. Syst., III., 1, 425, *Bombyx*.
1797—Sm. Abb., Ins. Ga., II., 137, *Phalæna oculatissima*.
1855—Wlk., C. B. Mus., Lep. Het., III., 689, *pr. syn.*
oculatissima Sm. Abb.
1797—Sm. Abb*, Ins. Ga., II., 137, pl. 69, *Phalæna*.
1841—Duncan, Nat. Libr., XXXII., pl. 30, f. 4.
1864—Pack., Proc. Ent. Soc., Phil., III., 127, *pr. syn.*
cunegunda Cramer.
1782—Cram., Pap. Exot., IV., 104, pl. 344, f. D. E., *Phalæna*.
1805—DeB., Ins. Afr. et. Am., 134, pl. 24, f. 4, *Bombyx*.
1865—Grt. & Rob., Ann. Lyc., N. Y., VIII., 368, *pr. syn.*
var. *denudata* Slosson.
1888—Slosson, Ent. Amer., III., 212, *Ecpantheria*.
Habitat—Canada to Florida, to Texas, to California.
Food plant—Omnivorous.

I do not see why the term *oculana* Fabr. should not be restored for this species, but do not make the substitution lest there be some reason I have not yet discovered, to prevent it. Walker makes the reference, but retains the later name. Packard cites Walker, but does not refer at all to *oculana*, although *oculatissima* is referred to in the synonymy. Smith and Abbot refer to *oculana* as identical with their form, and also cite Cramer's figure of *cunegunda*, which also antedates *scribonia*.

E. sennettii Lint.
1884—Lintner, Papilio, IV., 147, *Ecpantheria*.
Habitat—Texas.

Genus Nelphe Boisd.

I do not know this genus at all, either autoptically or by description. The only described American species is :
N. carolina Hy. Edw.
1886—Edw., Ent. Amer., II., 166, *Nelphe*.

(To be continued.)

NOTES ON ARGYNNIS FREYA, CHARICLEA AND MONTINUS.

BY H. H. LYMAN, MONTREAL.

As is well known to readers of the CANADIAN ENTOMOLOGIST, Mr. Scudder, in his sumptuous work on the Butterflies of New England recently published, stated that Mr. Edwards had confused the two northern species, *Argynnis Freya* and *Chariclea*. This was denied by Mr. Edwards in the April number of this journal and Mr. Butler's authority was invoked to prove that Mr. Scudder had himself transposed these names. Here the matter rests, but as I think that I can throw some additional light on the question I shall endeavour to do so.

In the preface to Mr. Scudder's work he states that "twenty years ago the present work was definitely planned, announced and begun and the greater part of it has been written for fifteen years," though he adds that much of it was rewritten within the past few years.

On page X. of the same preface, in speaking of the appendix in which certain butterflies not found in New England are described, he says: "It was, however, an afterthought not entering into the original plan * * * * it has, indeed, been written during the printing of the work." This fact that the first volume was written fifteen or more years ago and the third only last year, no doubt explains the contradictory statements in reference to the affinities of *Argynnis Montinus* which appear in these volumes.

On page 604 of the first volume Mr. Scudder, in speaking of *A. Montinus*, says: "This species is certainly distinguishable from B. chariclea (Schneid), or B. chariclea boisduvalii (Somm.), both of which forms have been found by Mr. Couper on the northern shore of the Bay of St. Lawrence. Whether it should be looked upon merely as a geographical race, or as a species, is a question about which there may be easy difference." This certainly implies a very close connection between these forms, and in the original description of *Montinus*, in Scudder's "List of the Butterflies of New England," published in the Proceedings of the Essex Institute in April, 1863, reference to which he curiously enough omits from his recent work, he began his description with "Very similar to *A. Chariclea*."

So far so good, but on turning to the appendix in the third volume, page 1807, under the heading of *Brenthis freija* Thunb., which is the same as *Freya* Hübn., he says: "This species is very closely allied to

B. Montinus." Now, these two statements are quite irreconcilable, for while it is quite true that some so-called species stand so close together that a third may be quite correctly described as very close to both, this is certainly not the case with the species in question, which are very distinct. I think it will therefore be conceded that Mr. Scudder is wrong in one of these statements, and we can therefore proceed to examine which is erroneous, and I believe it will be found that in this case second thoughts were not best.

Both *Chariclea* and *Freya* occur in Europe and have been studied and illustrated by European entomologists. *Freya*, or *Freija*, is figured and described in Boisduval's *Icones*, p. 100, pl. 19, fig. 4, 5, and in the same work there is a description and figure (p. 98, pl. 20, fig. 5, 6) of *A. Boisduvalii*, which all the authorities that I have been able to consult, with possibly one exception, concede to be but a variety of *Chariclea*. Both of these references were omitted by Kirby from his catalogue and the former was overlooked by both Edwards and Scudder, but both are given in Strecker's catalogue. The figures in Boisduval's work, though inferior to those to which Messrs. Edwards and Scudder have accustomed us, are still sufficiently accurate to prove that it is truly *Chariclea*, as stated by Mr. Scudder in his first volume, to which *A. Montinus* is allied.

Mr. Scudder also makes the mistake of giving, doubtfully it is true, *M. Tarquinius* Curtis as a synonym of *A. Boisduvalii*, while all the other authorities give it as a synonym of *Freya*. From its description in the appendix to the "Narrative of Sir John Ross," it must certainly be very close to *Freya*, and is probably identical with it, but it has no connection with *Chariclea* or its variety, *Boisduvalii*. It thus appears that Mr. Scudder must have confused these species, and so transposed their names, a very curious mistake, and apparently similar to that which he formerly made in regard to *Phyciodes Harrisii* and *Nycteis*, to which I called his attention in 1878.

As there are doubtless many readers of this journal who are not familiar with these northern species of *Argynnis*, a few descriptive notes may not be out of place.

Chariclea may be described as somewhat like *Myrina* upon the upper side, though the markings are heavier, especially upon the secondaries, and it is rather more deeply shaded at the bases of the wings. There is, however, a very striking difference in the fact that in *Chariclea* the cres-

cent-shaped markings on the hind wings open outwards, while in *Myrina* they are much lighter and open inwards. There is, of course, no similarity between these species on the under side.

Freya is strikingly different from *Chariclea* upon both the upper and the under surfaces. Above the colour is duller and the bases of the wings are very heavily shaded; in fact, in the case of the secondaries, this shading extends over nearly the half of the wing. In *Chariclea* the black so-called mesial band is composed of a series of almost straight bars placed rather irregularly, while in *Freya* it is made up of a series of deep lunules. A like difference may be observed on the secondaries, but it is not quite so marked. On the under side of primaries similar differences are observable, although the markings are lighter; but the under side of secondaries show the most marked differences, for the beautiful band of pearly lunules crossing the wings just outside of the mesial black band in *Freya* has no counterpart in *Chariclea* and the course of the black band in its deep lunules is also very distinct.

There are many other points of difference between these species, but it is not very easy to indicate them clearly without going into a tedious description.

Mr. Scudder's descriptions of these species being reversed, what he says of *Freija* belongs really to *Chariclea*, and *vice versa*. These descriptions are given in great detail and are generally correct, but contain several curious errors. For instance, in describing the primaries of his *Freija*, but really *Chariclea*, he says: "Within the mesial band are three narrow transverse bands crossing the cell, the innermost not reaching the median nervure; within these is a small lunule opening outward." Surely he should have said inward, as the concave side of the lunule is towards the base of the wing. I might also allude to the fact that he says that the mesial band starts "a little beyond the middle of the costa"; as it really starts at a point very nearly two-thirds from the base of the wing I consider his statement rather loose for a man as particular as Mr. Scudder is known to be. Similarly in describing *Freya*, or *Freija*, he says that the black mesial band of primaries starts at the middle of the costa, while it is really not less than three-fifths from the base. In describing this form he omits to mention the small lunule inside the three bars crossing the cell, though it is recognizable, at least in my specimens, in spite of the heavy shading just inside of it, and he also fails to observe that the

black mark below the first divarication of the median nervure is angulated in a similar manner to that in the other species. But the most curious statement is that which he makes in speaking of the underside of primaries, where he says that "the sagittate spots are more delicate, and the nervules beyond them are distinctly yellowish or white," whereas these yellowish or white lines are on the creases forming the centres of the interspaces and not on the nervules at all.

There are other slips in these two descriptions, but mention of these is sufficient to show that Mr. Scudder's descriptions, though laboured, are not always quite accurate. Mr. Scudder also speaks of these species as flying—one in May, or early in June, and the other late in August, or early in September. At Laggan, however, where my specimens were collected by Mr. Bean, the difference of seasons was not so marked, as *Freya* was obtained May 11th and 16th, and *Chariclea* June 29th to July 18th. The latter occurs, however, later than this, and is doubtless found up to the end of August.

ON THE LISTS OF COLEOPTERA PUBLISHED BY THE GEOLOGICAL SURVEY OF CANADA, 1842–1888.

BY W. HAGUE HARRINGTON, OTTAWA.

(Continued from page 160, Vol. xxii.)

SCARABÆIDÆ.

Onthophagus Hecate *Panz.* A.O., W., S.M.
Aphodius fossor *Linn.* St.L.
validus *Horn.* W.
fimetarius *Linn.* A.O., St.L., T.L.
ruricola *Melsh.* W.
fœtidus *Fab.* T.L.
pectoralis *Lec.* B.C.
granarius *Linn.* S.M.
leopardus *Horn.* Y.F., N.O., O.
Geotrupes Egeriei *Germ.* A.O.
Dichelonycha subvittata *Lec.* A.O., St.L.
Backii *Kirby.* B.C., M.
Serica tristis *Lec.* S.M.

Diplotaxis brevicollis *Lec.* B.C.
Lachnosterna fusca *Fröh.* L'O., St.L., B.C., S.M.
Osmoderma eremicola *Knoch.* L'O.
scabra *Beauv.* A.O.
Trichius piger *Fab.* A.O.
affinis *Gory.* N.O., W., S.M., O.K.

SPONDYLIDÆ.

Spondylis upiformis *Mann.* B.C.

CERAMBYCIDÆ.

Orthosoma brunneum *Forst.* (unicolor *Drury).* L'O.
Asemum atrum *Esch.* B.C.
Criocephalus agrestis *Kirby.* N.C., Y.F., C.L., S.M, O., N., C.R.
Tetropium cinnamopterum *Kirby.* O.
Gonocallus collaris *Kirby.* C.R.
Hylotrupes ligneus *Fab.* [Physocnemum]. St.L., O.
Phymatodes dimidiatus *Kirby.* B.C.
Merium proteus *Kirby.* B.C., Y.F., N.O., C.L., O., N., C.C., C.R.
Xylotrechus undulatus *Say.* N.C., N.O., C.L., S.M., O , N., C.R.
Neoclytus muricatulus *Kirby* [leucozonus *Lap.*]. N.O.
Desmocerus palliatus *Forst.* S.M.
Encyclops cæruleus *Say.* A.O.
Rhagium lineatum *Oliv.* O.
Pachyta monticola *Rand* (Evodinus). A.O.
liturata *Kirby.* B.C., C.L., N.
Achmæops proteus *Kirby.* A.O., N.O., O., C.R.
pratensis *Laich.* N.C., N.O., S.M.
Leptura subargentata *Kirby.* B.C., N.C.
var. similis *Kirby.* N.O.
sexmaculata *Linn.* N.C., O., C.R.
nigrella *Say.* C.R.
canadensis *Fab.* A.O., O.K.
chrysocoma *Kirby.* N.C., S.M.
proxima *Say.* A.O.
vittata *Germ.* A.O.
pubera *Say.* A.O., S.M.

mutabilis *Newm.* A.O.
aspera *Lec.* S.M.
Monohammus maculosus *Hald.* S.M.
scutellatus *Say.* A.O., St.L., N.C., Y.F., N.O., S.M., M., H.M., M.F., O.K., O., N., C.R.
race oregonensis *Lec.* B.C.
confusor *Kirby.* A.O., St.L.
marmorator *Kirby.* H.M.
Pogonocherus penicellatus *Lec.* H.M., O.K., O.
mixtus *Hald.* N.C.
Saperda vestita *Say.* L'O.
tridentata *Oliv.* A.O.

CHRYSOMELIDÆ.

Donacia pubicollis *Suffr.* O.K.
palmata *Oliv.* A.O.
hirticollis *Kirby.* C.L., M.F., N.
magnifica *Lec.* C.L., C.C.
proxima *Kirby.* N.O., C.L., M.F., C.C., R.A.
subtilis *Kunze.* A.O., C.L., H.M., C.C., R.A.
æqualis *Say.* O.K.
cuprea *Kirby* [pusilla *Say.*]. A.O., T.L., N.
aurea [? misprint for aurifer *Lec.*, =*var.* cuprea]. M.F.
flavipes *Kirby.* A.O., T.L.
Orsodacna atra *Ahr.* [Childreni *Kirby*]. B.C., N.C.
Syneta ferruginea *Germ.* [tripla *Say*]. A.O., B.C.
Cryptocephalus 4-maculatus *Say.* C.C.
Adoxus obscurus *Linn.* [vitis *Fab.*]. A.O., B.C., N.C., O.K., N.
Chrysochus auratus *Fab.* A.O., S.M.
Graphops marcassita *Cr.* S.M.
Entomoscelis adonidis *Fab.* B.C.
Prasocuris Phelandrii *Linn* [Helodes trivitta *Say*]. L'O.
varipes *Lec.* S.M.
Doryphora clivicollis *Kirby* [Chrysomela trimaculata *Fab.*]. L'O.
10-lineata *Say.* S.M.
Chrysomela scalaris *Lec.* A.O., St.L.
philadelphica *Linn.* S.M., T.L.

var. spirææ *Say.* A.O., N.C.
multipunctata *Say*, *race* verrucosa *Suffr.* B.C.
Plagiodera oviformis *Lec.* B.C.
Gastroidea polygoni *Linn* [Gastrophysa]. W.
cyanea *Melsh* [Gastrophysa] W., N.
Lina lapponica *Linn* [Plagiodera interrupta *Fab.*]. A.O., B.C., C.L., O.K., C.R., *var.*
scripta *Fab.* O.K.
Gonioctena arctica *Mann.* N.C.
pallida *Linn* [rufipes *DeG.*]. B.C., Y.F., N.O., O., N.
Phyllodecta vitellinæ *Linn.* A.O.
Phyllobrotica decorata *Say.* A.O.
Galeruca sagittariæ *Gyll.* A.O., B.C. *? var.*, N.O., C.L., H.M., O.K., O., N., C.C.
Hypolampsis pilosa *Ill.* C.L.
Oedionychis lugens *Lec.* B.C.
scripta [? misprint for scripticollis *Say* =*var* vians *Ill.*]. C.L.
Disonycha collaris *Fab.* [Haltica]. L'O.
Haltica bimarginata *Say* [Graptodera]. B.C., N.C., N.O., M.F.
evicta *Lec.* [Graptodera]. B.C.
Crepidodera mancula *Lec.* B C.
Systena frontalis *Fab.* A.O.
Chelymorpha argus *Licht.* [cribraria *Fab.*]. L'O., W.

Tenebrionidæ.

Phellopsis porcata *Lec.* B.C.
Coniontis ovata [? misprint for ovalis *Esch.*]. B.C.
Eleodes cordata *Esch.* B.C.
Nyctobates pennsylvanicus *DeG.* (Ipthimus). L'O.
Ipthimus opacus *Lec.* S.M.
Upis ceramboides *Linn.* (reticulatus *Say*). A.O., St.L., B.C., C.L., S.M., O.K., O., N., C.C., R.A.
Tenebrio molitor *Linn.* L'O , N.O., W., S.M.
tenebriodes *Beauv.* S.M.
Blapstinus moestus *Melsh.* S.M., H.M.
interruptus *Say.* S.M.
Hypophlœus punctatus [misprint ?]. B.C.
Boletotherus bifurcus *Fab.* (Bolitophagus cornutus *Pz.*). A.O.

CISTELIDÆ.

Isomira quadristriata *Coup.* S.M.
Hymenorus pilosus *Melsh.* S.M.

LAGRIIDÆ.

Arthromacra ænea *Say.* S.M.

MELANDRYIDÆ.

Penthe obliquata *Fab.* M.F.
Serropalpus barbatus *Schall.* [substriatus *Hd.*]. St.L., O.
Stenotrachelus arctatus *Say.* N.C., M.F., O.

PYTHIDÆ.

Crymodes discicollis *Lec.* B.C.

CEPHALOIDÆ.

Cephaloon tenuicorne *Lec.* B.C.

MORDELLIDÆ.

Mordellistena vitis [? misprint for vilis *Lec.*]. B.C.
nigricans *Melsh.* A.O.

ANTHICIDÆ.

Corphyra lugubris *Say.* S.M.
collaris *Say.* (Pedilus). A.O.

MELOIDÆ.

Meloe angusticollis *Say* (rugipennis *Lec.*). A.O., St.L., N.
americanus *Leach.* N.C.
Macrobasis unicolor *Kirby.* S.M., O.K.
Cantharis cyanipennis *Say.* B.C.

OTIORHYNCHIDÆ.

Evotus naso *Lec.* B.C.

CURCULIONIDÆ.

Sitones flavescens *Marsh.* (lepidus *Gyll.*). A.O.
Trichalophus alternatus *Say.* B.C.
Lepyrus gemellus *Kirby.* N.
colon *Linn.* B.C., N.G.

Pissodes strobi *Peck.* H.M.
costatus *Mann.* B.C.
dubius *Rand.* H.M.
Hylobius pales *Hbst.* A.O., S.M., O., C.R.
confusus *Kirby.* S.M.
Hypomolyx pineti *Fab.* [pinicola *Coup.*]. A.O. (near pineti), O., N., C.R.
Lixus caudifer *Lec.* B.C.
Dorytomus laticollis *Lec.* B.C.
Acalyptus carpini *Hbst.* Y.F.
Baris confinis *Lec.* S.M.

CALANDRIDÆ.

Dryophthorus corticalis *Say.* S.M.

SCOLYTIDÆ.

Xyloterus bivittatus *Kirby.* T.L.
Dryocœtes septentrionis *Mann.* B.C.
Dendroctonus rufipennis *Kirby* [obesus *Mann.*]. B.C.

ANTHRIBIDÆ.

Gonotropis gibbosus *Lec.* C.C.
Report of Progress, 1882–83–84, p. 62d.
List of Coleoptera collected by J. R. Spencer, at Fort Churchill, (determined by Mr. J. B. Smith for Mr. James Fletcher, 14 species).
Carabus chamissonis *Fisch.*, var. baccivorus *Fisch.*
Pterostichus hudsonicus *Lec.*
Amara hyperborea *Dej.*
similis *Kirby.*
Agabus [Gaurodytes] griseipennis *Lec.?*
Colymbites sculptilis *Harr.*
Dytiscus dauricus *Gebl.* [confluens *Lec.*].
Cryptohypnus abbreviatus *Say.*
Criocephalus obsoletus *Rand.*
Neoclytus conjunctus *Lec.*
Pachyta liturata *Kirby.*
Acmæops proteus *Kirby.*
Two species unknown to Mr. Smith.

Annual Report (new series), Vol. I., 1885, p. 26dd.

List of Coleoptera collected in 1885, by Dr. Robert Bell, in connection with the Hudson's Bay expedition, (determined by Dr. G. H. Horn for Mr. W. H. Harrington, 10 species).

Stupart's Bay.

Amara hypoborea *Dej.* Over 100 specimens.
Pterostichus hudsonicus *Lec.*
Hydroporus longicornis *Sharp.* Occurs in Europe.
perplexus *Sharp.*
Agabus dissimilis *Sahlb.* [longulus *Lec.* ?]. Fifty specimens.

After the list was printed, Dr. Horn sent specimens of this species, which he had referred with doubt to *longulus* Lec., to Dr. Sharp, who determined them to belong to *dissimilis* Sahlb.

Cape Chudleigh.

Nebria Sahlbergi *Fisch.*
Amara hyperborea *Dej.*
Lepyrus colon *Linn.*

Cape Digges.

Amara hyperborea *Dej.*
Agabus dissimilis *Sahlb.* [longulus *Lec.* ?].
Criocephalus agrestis *Kirby.*

Blanc Sablon.

Nebria Sahlbergi *Fisch.*
Pterostichus Luczotii *Dej.*
Quedius sublimbatus *Mäkl.*

Annual Report (new series), Vol. III., p. 75j.

List of Coleptera taken on the South Coast and Islands of James Bay, by Mr. J. M. Macoun, in 1887, (determined by Mr. James Fletcher, Dominion Entomologist, 21 species).

Cicindela 12-guttata *Dej.*
Calosoma frigidum *Kirby.*
Chlænius sericeus *Forst.*
Silpha lapponica *Hbst.*
Buprestis maculiventris *Say.*
Asemum mœstum *Hald.*
Criocephalus obsoletus *Rand.*
Xylotrechus undulatus *Say.*

Rhagium lineatum *Oliv.*
Pachyta liturata *Kirby.*
Acmæops proteus *Kirby.*
Leptura chrysocoma *Kirby.*
Monohammus scutellatus *Say.*
Orsodacna atra *Ahr.*
Adoxus obscurus *Linn.* [vitis *Fab.*].
Lina lapponica *Linn.*
Gonioctena pallida *Linn.*
Upis ceramboides *Linn.*
Lepyrus colon *Linn.*

P.S.—Line 18, page 155, should read longulus *Lec.* [Gaurodytes]. Y.F.

BOOK NOTICE.

THE PHYCITIDÆ OF NORTH AMERICA, BY GEO. D. HULST.

This valuable paper forms number 2, volume 17, of the Transactions of the American Entomological Society. The author not only gives us what has been done on this family by others, but also the results of his own critical and long continued study and investigation.

He complains of difficulties in the study of these insects owing to the fact that so many of the types are in European museums, and further, that so many are in private collections. There may be some question whether this last is not an advantage, for, as a rule, private collections are more easily accessible than public ones, and the visitor is not hampered by stringent rules. There is but little use to attempt the study of microlepidoptera in a museum where the rules forbid the removal of an insect from the trays, as is the case in many.

The Phycitidæ are given family rank "in the super-family Pyralidæ," and after the family characters, the literature of the subject is quite fully and very fairly given, which is always a difficult task. Mr. Hulst divides the family into two sub-families, based on the presence or absence of the lower anal plate, and differs from Ragonot, who divides them on the development of the tongue. From my own studies I am inclined to agree with Mr. Hulst.

The structure of the imago is treated thoroughly and exhaustively.

This part of the work is a model worthy of imitation by other systematic writers. When all our insects have been studied in this careful manner and then monographed, we shall have a sound basis for further work.

A vast field is open for future investigation on the early stages of these insects, and undoubtedly our economic entomologists will, in time, give us much valuable information in this direction now that the way is made clear.

The author states that he "takes little interest, comparatively, in the guesses which are made of the ancestry of any group of the Lepidoptera." I am greatly surprised that he should decline to enter upon this fashionable field of conjecture. A person may as well be out of the world as out of fashion!

There are given synopses of the sub-families and of the genera, and under each genus is a synopsis of the species. A valuable feature is the giving of the type under each genus and the full synonomy. A list of undetermined species is also given with the original descriptions. Seven of these are Walker's species and the remaining three were published by Clemens. It would have been a great satisfaction if Mr. Hulst had given us the correct pronunciation of the generic names, especially those of Indian origin, for some of us may forget our Latin so far as to pronounce some of them incorrectly.

Under Notes on other Species, p. 221, by a slip it is stated that *Nephopteryx intractella* Walk. is a synonym of *Blepharomastix ranalis* which is itself a synonym of *Botis similalis* Guen. As the information went from me, and I may have made the slip myself in writing, I take this occasion to correct and say that *Nephopteryx intractella* Walk. is a synonym of *Nymphula similalis* Guen., and is given in Grote's Check-List under the name of *Eurycreon rantalis* Guen. See Ent. Am., Vol. 5, p. 211.

At the end is given a catalogue of the Phycitidæ of North America, comprising 71 genera and 201 species, followed by three plates of structural details.

On the whole this is one of the most satisfactory papers on the microlepidoptera I have ever seen, and it is "devoutly to be wished" that Mr. Hulst will immediately take up the *Geometridæ* and treat them in as thorough and complete a manner as he has the *Phycitidæ*.

C. N. Fernald.

Mailed September 11th.

The Canadian Entomologist.

VOL. XXII. LONDON, OCTOBER, 1890. No. 10.

PROCEEDINGS OF THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Club assembled in the State House at Indianapolis, Ind., on Wednesday, August 20th, 1890, and began its regular sessions at 9 o'clock a. m., the President, Prof. A. J. Cook, Agricultural College, Mich., in the chair.

There were present during the meetings :—W. B. Alwood, Blacksburg, Va.; Geo. F. Atkinson, Columbia, S. C.; W. S. Blachley; P. Carter; Prof. E. W. Claypole and K. B. Claypole, Akron, Ohio; F. S. Earle, Ocean Springs, Mich.; S. G. Evans, Evansville, Ind.; James Fletcher, Ottawa, Ont.; H. Garman, Lexington, Ky.; Mrs. O. Hanney; C. W. Hargitt, Oxford, Ohio; Thos. Hunt; John Marten, Albion, Ill.; Miss Mary E. Murtfeldt and Miss Augusta Murtfeldt, St. Louis, Mo.; W. W. Norman; Prof. Herbert Osborn and L. H. Pammel, Ames, Iowa; R. S. F. Perry; C. Robertson, Carlingville, Ind.; Prof. J. W. Spencer, Athens, Ga.; James Troop and Prof. F. M. Webster, Lafayette, Ind.; Dr. Clarence M. Weed, Columbus, Ohio, and others.

The President, Prof. A. J. Cook, delivered the following address :—

ON TEACHING ENTOMOLOGY.

Ladies and Gentlemen of the Entomological Club,—I congratulate you that another year has passed, and our number has not been broken in upon by death. While our ranks have been much enlarged, no one has been called to that undiscovered country from whose bourne no traveller returns. I also congratulate you upon the great increment in our force of working entomologists. I think I may say, with no fear of contradiction, that no year in the history of America has been so remarkable in this respect as has the last. This is a cause for special felicitation, not only to entomologists, but to all our people. Ours is a tremendous country—by ours I include, of course, our Canadian brothers, for we, as scientists, know no line of separation—and to spy out the entire land needs an army of workers or observers, all trained to keen sight and

ready apprehension. But more than this the magnitude of our country is fully equalled by the magnitude of the insect hosts, and to know all of these, with their full life history, requires an incalculable amount of closest research. But our business economy demands this for all our species: for so wonderful is the balance of nature, so close the relations of all species of life, that really we may hardly divide insects into those important and those unimportant in our agricultural economy. All are important; and so from an economic, no less than a scientific standpoint, it is desirable that all such research be widely encouraged, and it is a most hopeful omen—the rapid increase of earnest and trained workers. I shall not in this address occupy time by giving the peculiarities of the season in respect to insects, nor yet call attention to interesting discoveries, like the importation of the *Vedalia cardinalis*. All these will be brought out in papers and discussions. I must, however, refer to the new association for the advancement of economic entomology, which was organized at Toronto a year ago, and which held its first meeting at Washington last November. This meeting, under the Presidency of Dr. Riley, was a valuable one; and that society promises much for the science of entomology, as well as for its economic development. It is also a matter of much interest that a new paper—"Insect News"—is started at that great centre of entomology—Philadelphia—which will also do much every way for our science. This, with the very excellent periodical "Insect Life," published by the Entomological Division of the Department of Agriculture, can but give new impetus to entomological research. In addition to these, we have an addition to Prof. Comstock's admirable work, which, when completed, will form a most valuable adjunct in the development of entomology. If we may judge from what we already have, this will be invaluable in every entomological laboratory. When the Society of Economic Entomologists was organized a year ago it was remarked by one of our first entomologists that that move sounded the death-knell of this Club. I then remarked that such ought not to be the case. That Society is to be composed only of those interested in economic entomology, and of course will only put emphasis in the direction of the practical aspects of the science; this more or less of entomologists in a wider sense, and so will include those interested in practical entomology and also in the science without relation to utility. The Club then may well continue. I believe it will live and thrive, and

will be most helpful to entomologists and to our science. While the other Association will discuss economic questions, this Club will place no limit on either its discussions or its membership, only so far as entomology shall be its aim and purpose. No one doubts but that he who has a thorough training in the science of entomology will be far better prepared for practical work, and so there can be only the most cordial relation between the Association of Economic Entomologists and this Club. Indeed, many of our most active entomologists will be members of both. I have already stated the truism that only can he do the best practical work in entomology who is thoroughly well grounded in the general science of entomology. As we now have a great call for entomologists in our experimental stations, agricultural colleges, and as State entomologists, not to speak of the fact that every farmer and fruit-grower would be more successful if he were well informed in this science, it goes without saying that there ought to be in training men for just such work. It seems to me that it needs no argument to show that our agricultural colleges are just the places where this training should be given. They were founded to teach those subjects which would be most serviceable on the farm. Entomology is one of the chief of these. Thus it follows that every student of agriculture should have a thorough course in this science, with the practical aspect of the subject kept in the foreground. In thus presenting this science to large classes — I have from thirty to forty each year who study this subject in the course—the teacher will find some in each class who are specially fitted to succeed. They enjoy the study and work most earnestly just for the love of the pursuit. They have quick observation, and are very accurate and honest in all their work. It needs no prophet to bespeak success in this field for such students. Our agricultural colleges are just the places to discover the men who have great possibilities in this direction ; just the places to give the training that shall best fit men to do the most valuable work. It will be my purpose in the remainder of this address to describe the equipment for such work, and to explain the method which I believe will give the best results. Of first importance is a good library ; this should contain all the standard works, periodicals and monographs, so that students who may decide to study any insect or genus, may find what has been written on the subject. Of course this cannot be had at once, but it is so essential

that no effort should be spared to build up a complete entomological library at the earliest possible moment. *True*, the scientist should study *things*, not books, but he will find a wide use of books most helpful in his study. Next to a library, such colleges should have good collections, which are often of more value than the library. A small show collection, illustrating the families and orders, and the several stages of the most injurious species of the place as well as the groups of beneficial ones should be open to the public. This will be studied and appreciated by the practical farmer, who, as he visits the college, will find it helpful, and will also interest and stimulate the under-class men, who will thus have their attention called towards insects before they commence the regular study, which will not occur till they are well along in the course. Drawing, botany, microscopy, and French and German, if thoroughly understood, will be great aids to the student who commences the study of entomology. Thus this study will come late in the course and the show collection will be whetting the appetite of the under-class men from the time they enter college until they commence the study. I would also have what I call a student collection—this is a pretty full collection from the locality of the college. This I would hang upon the wall of the lecture room, which I would have dark, except when in use, so as to preserve the colour of the specimens. I would have this in rather small cases, with glass in front and also back where it is desirable, as in case of Diurnals, to study both under and upper sides of the wings. This collection should show at least types of each group in all stages, from egg to imago, as well as nests, cocoons, etc. This is an object lesson ever before the student, is ever ready for use by the teacher to illustrate his lecture, and is at the disposal of the students in naming their own collections or in closer study of any group. It seems to me such a collection should be in every college. Lastly, I would have a laboratory collection which should be a biological collection, and the fuller the better. This is in large, tight, glass-faced drawers. I use the Harvard case. This is for the use of teachers and post-graduates who desire to study further in the science. It is too valuable for general use by the student or to be kept to satisfy general curiosity.

"THE COURSE OF STUDY."

As I have before remarked, before the student commences the study of insects he should have had a good course in free-hand drawing, should

have had instruction in the use of the microscope and in preparing microscopic specimens and slides, and if he has a ready use of German and French it will be very helpful to him in his study. It is also desirable that the student should have had a full course in botany. The students of our college have had three terms of botany, one devoted entirely to microscopic botany, before they begin the study of entomology. I consider this very valuable preparatory work. Entomology is very close precise work, and the laboratory work if carried on for a less space than three hours at a time is not satisfactory. But three hours of such close work is very wearying unless the student has had a fitting preparation. Thus I am pleased that our students have had *vertebrate dissection* with human and comparative anatomy and physiology before they commence entomology. I know this seems the reverse of the natural method ; as nature proceeds from lower to higher ; vertebrate dissection is lighter and less trying to eye and brain than is the study of insect anatomy ; thus I am pleased to have Anatomy and Physiology of Vertebrates precede that of the Arthropoda in our course. In our College the student attends a course of sixty lectures on the anatomy and physiology of insects, systematic entomology and the economic bearing of the subject. These lectures are illustrated by use of models, the student's collection of insects, already referred to, by microscopic preparations, mostly prepared at the College, and elaborate charts and drawings also prepared specially for our use. In connection with this course there are 36 hours of laboratory. Each student works three hours one day each week for twelve weeks. In this time they are able to study the internal anatomy, and to examine carefully and accurately one insect of each order. In connection with this several insects are traced to the genus by such keys as Leconte and Horn, Cresson, Williston, etc. Besides the above, each student makes a collection of from ten to twenty-five insects of each order, all neatly put up with date and locality label ; each order by itself and all labelled as far as time will permit. Many students succeed in naming a large number of their specimens. Each student is also required to mount insects in all the approved ways. Small insects mounted on triangular pieces of cardboard or rectangles of cork with silver wires, while the larvæ are put in bottles of alcohol with rubber corks and also prepared by eviscerating and drying, while distended with air, in a heated oven. The students are also encouraged to prepare biological collections, in

which they preserve the eggs, larvæ after each moult, pupa, cocoon, imago of both sexes, and of various sizes and the several variations. Some of our most enthusiastic students work out several such life histories, describing not only the separate stages, but the several parasites that work to destroy the insects. I regard this work as very valuable. It is excellent discipline for the mind and observation, gives accurate information of the most interesting kind, and arouses enthusiasm for the study as nothing else can. It is such work as this that will tell for the future of entomological research, that will make entomologists, who will honour alike the fields of pure and applied entomology. But such study ought not and will not stop here. Post-graduates will avail themselves of the opportunities which such laboratories offer. Last winter during our long vacation—ours is an agricultural college and our vacations must needs occur in winter, when farm operations are largely at a standstill—I had ten special students of entomology in my laboratory, one from South Dakota, one from Indiana, one from Ohio, one from Japan, one from Wisconsin, and the others from our own State. Nearly all were college graduates. Six special students, all graduates from colleges, have spent the year in my laboratory in special entomological study as post-graduate students. It seems to me that such are the young men who are going to develop the entomology of our country. They are the young men who can and will do grand work in our colleges and experimental stations. These young men each take up some special family or genus of insects, to which they give the major part of their time and study. They collect in all orders and give special attention to biological work, tracing the life histories of insects, identifying as far as possible the insects they capture and try to become familiar with entomological literature, so far as they are able. The students are mutually helpful to each other. As the laboratory may be said to be a sort of perpetual Natural History, or more accurately Entomological Society, thus the students become familiar with the general laboratory work, in fact, they each become a factor in some degree of carrying the work forward. Here I will close by explaining briefly the mode of our labaratory work, which differs in some degree from the admirable plan which Prof. Forbes explained at the Washington meeting of Economic Entomologists last November. Our labels give in compact space locality, date, accession and species number. The accession number agrees with a number—serial number—in our accession catalogue for the special year. Thus, ac. 400 shows that the insect or

insects bearing that label were the 400th collected during that season. The sp. number is given as the insect is determined, and is the number of the insect in the catalogue which we use. Thus, sp. 25 is "Cicindela purpurea," as the beetle is numbered 25 in Henshaw's catalogue of Coleoptera. In case the catalogue is not numbered, as is the case with Cresson's list of Hymenoptera, then we number it. We have a column in our accession catalogue for date, collector, person who named the specimen, and also for remarks. This last column is wide, and in it we can usually write all necessary information which we received in the collecting. If we are experimenting with or studying the insect, our notes are kept on cards. These are numbered to agree with accession catalogue, and are kept in serial order until we know the species when we add the species number as well. We now index the card and place it in its correct alphabetical position in our card collections. Thus we can very easily find our notes on any specimen, either by accession number or by the name of the species. This plan works well, and, it seems to me, is very economical in respect to time. Of course our students all see this scheme and become familiar with its workings.

Dr. C. M. Weed had listened with much pleasure to the President's address and approved of most of the points brought forward. He considered a knowledge of French and German of the utmost importance from the frequent necessity of consulting works in those languages when working up the life-histories of insects. He did not, however, like the label submitted by Prof. Cook, thinking that it entailed too great an expenditure of time. He had adopted Prof. Forbes's system of labelling, and had found that it answered all purposes.

Prof. Herbert Osborn approved very highly of the course of instruction in entomology outlined in the address.

Dr. C. M. Weed then read a paper upon the life-history of the evening primrose curculio *(Tyloderma foveolatum)* which he had bred from the stems both of Œnothera and Epilobium in large numbers.

Prof. F. M. Webster had listened to the paper with much interest; as stated by Dr. Weed he had given some study to the insect in question, and was pleased to hear these further observations. He had found that when a plant was infested the beetle occurred in all its stages, and that those near the base were always further advanced towards maturity.

The meeting adjourned.

(To be continued.)

ON THE FOOD-HABITS OF NORTH AMERICAN RHYNCHOPHORA.

BY WM. BEUTENMULLER, NEW YORK.

In the present paper I have attempted to bring together all the Food-Habits of North American Rhynchophora (except the Scolytidæ) that have been placed on record in the various entomological publications, with the addition of my personal observations on the subject.

Eugnamptus collaris and *E. angustatus* I have found plentifully upon the foliage of hickory and butternut trees.

Rhynchites bicolor may be found on various species of wild roses.

Pterocolus ovatus I have beaten from live oak trees at Kissimmee, Florida, May, 1887.

Attelabus bipustulatus lives on oak, rolling up the leaves (Murtfeldt, CAN. ENT., IV., p. 143). *A. analis* and *A. nigripes* also live on oak. The latter species I have beaten from live oak at Kissimmee, Florida, in April.

Graphorhinus vadosus feeds in the imago state on the leaves of clover, according to Mr. F. M. Webster (Am. Nat., 16, p. 746).

Epicærus imbricatus, according to Dr. C. V. Riley, is injurious to apple and cherry trees and gooseberry bushes, by gnawing the twigs and fruits; also said to be found on onions, radishes, cabbage, beans, watermelons, cucumbers, beets, squashes and potato, etc.

Exomias pellucidus. I have first taken this European beetle at Astoria, L. I., in the year 1884, and again on Staten Island in 1886. In Europe it lives on the strawberry. The food plant in this country has not yet been detected. (See Ent. Am., III., p. 188.)

Ophryastes vittatus is chiefly found on "greasewood," as is also *O. sulcirostris* and *O. latirostris*, according to Mr. Wickham (Ent. Am., V., p. 77).

Panscopus erinaceus occurs on wild grape. (Schwarz, Bull. Bklyn. Ent. Soc., VII., p. 84.)

Diamimus subsericeus was taken around the roots of cottonwood by Mr. Wickham (l. c., p. 78).

Otiorhynchus sulcatus. This European species is destructive to a variety of horticultural plants. In the larval stage it attacks the strawberry, devouring the roots. *O. ovatus* also infests the roots of this plant.

Aragnomus griseus was recorded by Dr. C. V. Riley as an enemy to pear trees in Oregon. (Insect Life, Vol. I., p. 16.)

Pachnæus opalus is injurious to the orange in Florida. *P. distans* feeds on oak. (Riley, Am. Nat., 16, p. 916.)

Tanymecus confertus appears to be polyphagus, without preference for any particular plant. (Riley, l. c.)

Anametis grisea in the larval stage lives under the bark of apple and pear. (Riley, l. c.)

Pandeletejus hilaris lives in the trunk of the white oak. (Harris, Inj. Ins., p. 70), also found on beech trees by Mr. F. M. Chittenden.

Brachystylus acutus is only found on the persimmon. (Riley, l. c.)

Neoptochus adsperus feeds on oak. (Riley, l. c.)

Artipus floridanus is injurious to the orange. (Riley, l. c.)

Aramigus tesselatus, according to Mr. E. A. Popenoe, infests the sweet potato. (Industrialist, May 29th, 1886.)

Aramigus Fulleri feeds on the roots of roses. (Riley, Rep. Dept. Agricul., 1878.)

Aphrastus tæniatus lives on the paw-paw. (Riley, l. c.)

Scythropus elegans is found on the pine, according to Mr. W. H. Harrington. (Trans. Ottawa Field Nat. Club, Vol. I., No. 2, p. 33, 1881.) Mr. F. H. Chittenden also found the insect in abundance on pine *(P. strobus)* at Ithaca, N. Y.

Eudiagogus pulcher and *E. Rosenschœldi* both feed on *Cassia occi dentalis* and *C. obtusifolia*. The former species I have found in large numbers at Enterprise, Fla., in May.

Sitones lineellus and *S. flavescens* are injurious to the clover and lucerne in Europe. *S. hispidulus* also lives on the roots of clover.

Plinthodes tæniatus I have beaten from small alder bushes in the Orange Mts., New Jersey. Whether the species lives on this plant I am unable to say.

Ithycerus noveboracensis is found on white and burr oaks. The larva bores in the tender twigs. I have also found the insect on hickory. Mr. W. H. Harrington found it on beech trees. (Rep. Ent. Soc., Ont., p. 52, 1880.)

Apion herculanum occurs on the flowers of *Viburnum acerifolia*, according to Dr. Hamilton. (Can. Ent., 20, p. 67).

Apion rostrum infests the seed pods of wild indigo *(Baptisia tinctoria)*.

Apion nigrum sometimes depredates the leaves of locust (*Robinia pseudacacia*). *A. fraternum* was observed upon two species of *Lespedeza* by Mr. F. H. Chittenden. *A. segnipes* was obtained from the seeds of a species of *Astragalus* by Say. (Le Conte, Ed., p. 265.)

Podapion gallicola makes a spherical or ovoid gall on pine (*Pinus inops*), Riley. (Bull. Bklyn. Ent. Soc., VI., p. 61.) I have also found the galls in the vicinity of Washington, D. C., last June.

Phytonomus punctatus lives on the leaves of clover. I have found it in abundance on timothy grass this season. *P. nigrirostris* also feeds on clover and *Buphthalmum Salicifolium*. *P. comptus* lives on *Polygonum*, and *P. eximius* on *Rumex*. (Riley, Rep. Dept. Agricul., 1881–82, p. 171.)

Listronotus latiusculus was found by Mr. C. M. Weed in all stages in the stalks of *Sagittaria variabilis*. Mr. F. M. Chittenden found *L. tuberosus*, *L. caudatus* and *L. appendiculatus* while sweeping a small patch of aquatic plants composed entirely of *Sagittaria* and a species of *Carex*. *L. appendiculatus*, it is said, was found by Mr. William Julich breeding in the lower parts of the stems of some species of reed. I have also taken two species of *Listronotus* on the flower heads of *Sagittaria* at Shingle Creek, Kissimmee, Florida, April.

Pissodes strobi is sometimes very destructive to the white pine. The larva and imago were first figured by Peck, in 1817. (Mass. Agricul. Reposit., IV., pp. 205, 211, pl. 1.) *P. affinis* is also found on the pine.

Pachylobius picivorus is placed by Mr. W. H. Harrington in a list of insects found on pine (Trans. Ottawa Field Nat. Club, I., p. 33).

Hylobius pales lives in pine trees beneath the bark, burrowing into and destroying the inner surface of the bark, and the tender newly formed wood, often doing great damage to pine forests.

Lixus rubellus has been observed in considerable numbers clinging to the leaves and blossoms of *Polygonum amphibium*. (Webster, l. c.)

Lixus parcus is said by Dr. Riley to form galls in the stems of *Amelanchier*. (Proc. Ent. Soc., Wash., I., p. 33.)

Lixus concavus. Glover has observed this insect burrowing in the foot stalks of rhubarb or pie plant. (Rep. Com. Agri., p. 90, 1865.) I have also found it on a species of *Rumex*, and also producing a gall in the stalk of the thistle, from which I raised the species. Mr. Webster also bred it from wild sunflowers. (Ent. Am., V., p. 11.)

Lixus macer. Dr. Riley reared this species from *Chenopodium*

hybridum. Coquillett observed it ovipositing in wild sunflower, as also did Mr. Webster. (Ent. Am., V., p. 11.)

Barytychius discoideus breeds in the flower heads of *Helenium tenuifolium.* (Schwarz, l. c.)

B. amœnus was found on ragweed by Dr. Hamilton. (Can. Ent., 18, p. 114.)

Smicronyx griseus and *S. tychoides* occur on ragweed *(Ambrosia),* according to Dr. Hamilton (l. c.)

Anchodemus angustus has been found by Mr. Harrington eating the leaves of a species of *Sagittaria.* (Can. Ent., 16, p. 118.)

Strophosomus coryli has been found by Mr. Bailey on sweet birch *(Betula lenta),* Jülich (Ent. Am., V., p. 56). In Europe, the species lives on oak, beech, pine and hazel.

Lissorhoptrus simplex lives on the roots of rice. (Riley, Rep. Dept. Agricul., p. 130, 1881–82.)

Magdalis barbita has been found ovipositing in fallen hickory *(Carya amara),* by Mr. Harrington. (Ent. Am., I., p. 18.)

Magdalis olyra burrows under the bark of oak. *M. armicollis* inhabits the elm.

Magdalis alutacea probably bores in the terminal twigs of *Pinus inops.* (Riley, Bull. Bklyn. Ent. Soc., VI., p. 62.)

Coccotorus scutellaris attacks the fruit of the plum.

Anthonomus quadrigibbus punctures the fruit of the apple and pear. The larva lives in the heart of the fruit, and feeds around the core.

Anthonomus suturalis attacks the cranberry, laying its eggs in the bud, and the larva living inside the fruit.

Anthonomus sycophanta was bred from the galls of a sawfly on willow.

Anthonomus musculus is very destructive to the strawberry.

Anthonomus pusillus lives in the seed pods of the frost weed *(Helianthemum canadense).* Blanchard (Ent. Am., III., p. 87).

Anthonomus gularis oviposits in the flowers of *Cassia marylandica.* (Schwarz, l. c.) *Anthonomus flavicornis* was found by Mr. Schwarz, inquilinous in a globular acarid gall on the leaves of *Solanum cleagnifolia.*

Otidocephalus chevrolatii occurs on elm and hickory, according to Mr. W. H. Harrington. (Can. Ent., 16, p. 118.) *O. laevicollis* was hatched by Dr C. V. Riley from the galls of a species of Cynips on oak.

Elleschus ephippiatus. I have taken this species in abundance on willow *(Salix fragilis).*

(To be continued.)

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 180, Volume xxii.)

Genus HALISIDOTA Hübner.

1816—Hübn., Verzeichniss, 170.
1855—Wlk., C. B. Mus., Lep Het., III., 732.
1862—Morris, Synopsis, 347.
1873—Stretch, Zyg. & Bomb., 87, fig. venation.

Head rather well developed; palpi exceeding front; tongue moderate, but somewhat variable in the species. Antennæ of ♂ long, lengthily bipectinated to the tip, a single branch to each side of each joint. Legs short and stout, posterior longest and weakest; spurs normal, but short; claws of tarsi simple.

Primaries with v 10 out of the subcostal before the end of the cell; 7–9 on a stalk from the same point with 6; 8 and 9 branching just before the tip; 4 and 5 from the same point at the end of the median; 3 from the median some distance before the end of the cell.

Secondaries with 8 from about the middle of subcostal and very short; 6 and 7 from the same point at end of the subcostal; 4 and 5 together from the end of the median; 3 from the median before the end of the cell.

H. caryæ served as the subject on which the above studies were made. It is not improbable that there may be some difference in details of structure in the species. Many of the described forms I have seen but casually, and of a few I have seen large series. This is, in my opinion, the most difficult genus in the *Arctiidæ*. There is a *phytophagic* variation in the larva, and the larvæ are not all of the same type. From the material in the National Museum collection it would seem, too, that larvæ widely different in type, not color merely, produce insects that are superficially almost indistinguishable. The synonymy is involved, and I give it exactly as I have found it.

H. agassizii Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 128, *Halisidota.*
1873—Stretch*, Zyg. & Bomb., 87, 102, pl. IV., ff. 8 and 9, and pl. X., f. 7, *Halisidota.*

1873—Edw., Proc. Cal. Ac. Sci., V., 187, *Halisidota.*
var. *alni* Hy. Edw.
1875—Edw.*, Proc. Cal. Ac. Sci., VII., 129, *Halisidota.*
Habitat—California.

Food plant—Willow, Alder.

H. ambigua Strk.

1878—Strk., Proc. Dav. Ac. Sci., II., 272, pl. IX., f. 7, ♂, *Halisidota.*
bolteri Hy. Edw.
1884—Edw., Papilio, IV., 121, *Seirarctia.*
1888—Edw., Ent. Amer., III., 182, *pr. syn.*
Habitat—Colorado, New Mexico.

H. argentata Pack.

1864—Pack., Proc Ent. Soc., Phil., III., 129, *Halisidota.*
1873—Stretch*, Zyg. & Bomb., 87, pl. 6, f. 12, ♀, *Halisidota.*
1873—Edw., Proc. Cal. Ac. Sci., V., 187, 369, *Halisidota.*
Habitat—California, Vancouver.

Food plants—Pinus pondorosa and P. lambertiana.

H. californica Wlk.

1865—Wlk., C. B. Mus., Lep. Het., XXXI., 311, *Halisidota.*
1873—Stretch, Zyg. & Bomb., 102, =*agassizii.*

angulifera Wlk.

1866—Wlk., Lords Trav. in Vanc. App., 335, *Halisidota.*
1873—Stretch, Zyg. & Bomb., 102, =*agassizii.*

salicis Bdv.

1868—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg., XII.), 81, *Phægoptera.*
1869—Grt. & Rob., Tr. Am. Ent. Soc., III., 175, *pr. syn.*

Habitat—British Columbia, Vancouver, California.

Mr. Grote, in his list of 1882, does not follow Stretch in his reference of this species to *agassizii*, but in a note, p. 63, suggests that *californica*, *agassizii* and *argentata* may be the same species.

H. caryæ Harr.

1841—Harris*, Rept., Ins. Mass., 258, *Lophocampa.*
1855—Fitch*, 1st Rept., Ins. N. Y., 159, *Halisidota.*
1860—Clem., Proc. Ac. Nat. Sci. Phil., XII., 533, *Halisidota.*

1862—Harris*, Inj. Insects, 361, pl. vi., ff. 1 and 2, and f. 175, *Lophocampa.*

1862—Morris in note to Harris l. c., *Halisidota.*

1862—Morris, Synopsis, 349, *Halisidota.*

1863—Saund., syn. Can. Arct., 20, *Halisidota.*

1872—Pack.. 4th Rept. Peab. Ac., 87, *Halisidota.*

1873—Stretch*, Zyg. and Bomb., 87, 140, pl. VI. f. 11, *Halisidota*

1874—Lint.*, Ent. Cont., III., 148, *Halisidota.*

porphyria H. Sch.

1855—H. Sch., Lep. Exot. sp. nov. f., 283, *Phægoptera.*

1858—H. Sch., l. c. p. 81, *Halisidota.*

1864—Pack., Proc. Ent., Soc., Phil., III., 128, *pr. syn.*

annulifascia Wlk.

1856—Wlk., C. B. Mus., Lep. Het., III., 743, *Halisidota.*

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 533, *Halisidota.*

1862—Morris, synopsis, Supplt., 349, *Halisidota.*

1862—Clem., in Morris Syn., 352, *pr. syn.*

1864—Pack., Proc. Ent. Soc., Phil., III., 128, *pr. syn.*

Habitat—Maine, New York, New Jersey, Mass., Arizona, N. Mexico, California, Canada.

Food-plants—Elm, hickory, Ash.

H. cinctipes Grt.

1865—Grt., Proc. Ent. Soc., Phil., V., 242, *Halisidota.*

1866—H. Sch., Corr. Blatt, Regensb., XX., 130, *Halisidota.*

188—Gundlach*, Cont. Ent., Cuba, 269, *Halisidota.*

1884—Hy. Edw., Papilio, IV., 76, *Halisidota.*

tessellaris‡ Wlk.

1856—Wlk., C. B. Mus., Lep. Het., III., 733, *Halisidota.*

1869—Grt. and Rob., Trans. Am. Ent. Soc., II., 72, *pr. syn.*

Habitat—Texas, Florida (?), Mexico, Cuba.

Food-plant—*Hibiscus* (Gundlach).

I have in some way mislaid my original reference to Gundlach's work, and do not find the date in the copy.

H. davisii Hy. Edw.

1873—Edw., Proc. Cal. Ac. Sci., V., 365, *Halisidota.*

Habitat—Arizona.

H. edwardsii Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 129, *Halisidota.*
1873—Stretch., Zyg. and Bomb., 88, pl. III., f. s, *Halisidota.*
1875—Edw.*, Proc. Cal. Ac. Sci., VII., 21—egg and young larva.

translucida Wlk.

1865—Walk , C. B. Mus., Lep. Het., XXXI., 310, *Halisidota.*
1868—Grt. and Rob., Trans. Am. Ent. Sci., II., 85, *pr. syn.*

quercus Bdv.

1868—Bdv., Lep., Cal. (Ann. Soc. Ent., Belg., XII.), 81, *Phægoptera,*
1869—Grt. and Rob., Trans. Am. Ent. Soc., III., 175, *pr. syn.*

Habitat—California.

H. ingens Hy. Edw.

1881—Edw., Papilio, I., 39, *Halisidota.*
Habitat—Arizona.

H. labecula Grt.

1881—Grt., Papilio, I., 174, *Halisidota.*
Habitat—New Mexico.

H. laqueata Hy. Edw.

1886—Edw., Ent. Amer., II., 166, *Halisidota.*
Habitat—Texas.

H. maculata Harr.

1841—Harris*, Rept. Ins., Mass., 259, *Lophocampa.*
1860—Clem., Proc., Ac. Nat. Sci., XII., 534, *Halisidota.*
1862—Morris, Synopsis, 349, *Halisidota.*
1862—Harris*, Injurious Insects, 363, *Lophocampa.*
1871—Saund.*, CAN. ENT., III., 186, *Halisidota.*
1873—Stretch., Zyg. and Bomb., 87, *Halisidota.*

fulvoflava Wlk.

1856—Wlk., C. B. Mus., Lep. Het., III., 733, *Halisidota.*
1858—H. Sch., Lep. Exot., sp. nov., 71, *Phægoptera*
1860—Clem., Proc. Ac. N. Sci., Phil., XII., 534, (?) *pr. syn.*
1862—Morris, Synopsis, App., 349, *Halisidota.*
1862—Clem., in Morris Syn., 352, (?) *pr. syn.*
1863—Saund., Syn. Can. Arct., 21, *Halisidota.*

1864—Pack., Proc. Ent. Soc., Phil., III., 128, *pr. syn.*

guttifera H. Sch.

1855—H. Sch., Lep. Exot., sp. nov., f. 284, *Phægoptera.*

1858—H. Sch., l. c., p. 71, *pr. syn.*

Habitat—Nova Scotia, Canada, Maine, Massachusetts, New York, New Jersey, Illinois, California.

Food Plant—Oak.

Halisidota megaphyrrha, Wlk., XXXI., 308, which should come in here has been referred to by Messrs. Grote and Robinson as not North America.

H. minima Neum.

1883—Neum., Papilio, III., 138, *Halisidota.*

Habitat—Arizona.

H. mixta Neum.

1882—Neum., Papilio, II., 133, *Halisidota.*

Habitat—Arizona.

(To be continued.)

ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Annual Meeting of the Society was held in the rooms, Victoria Hall, London, on Wednesday, August 27th. The following officers were elected for the ensuing year :—President, Rev. C. J. S. Bethune, D.C.L., of Port Hope ; Vice-President, Mr. James Fletcher, of Ottawa ; Secretary. Mr. W. E. Saunders, of London ; Treasurer, Mr. J. M. Denton, of London. Directors—Messrs. W. H. Harrington, Ottawa ; J. D. Evans, Sudbury ; Gamble Geddes, Toronto ; A. W. Hanham, Hamilton ; J. A. Moffat, London. Curator and Librarian, Mr. J. A. Moffat, London. Editor of the CANADIAN ENTOMOLOGIST, Rev. C. J. S. Bethune, Port Hope. Editing Committee, Mr. W. E. Saunders, London ; Rev. T. W. Fyles, Quebec ; H. H. Lyman, Montreal. Delegate to the Royal Society of Canada, Rev. T. W. Fyles, Quebec. Auditors, Messrs. J. H. Bowman and H. P. Bock, London. The President's address and a full account of the proceedings will be published in the Annual Report of the Society.

THE BUTTERFLIES OF INDIA.*

Some three years or more ago, we noticed a work on the above subject by Marshall and de Nicéville, of which two volumes had been published, the last by de Nicéville alone. A third volume of over 500 compact pages has just come to hand, the most notable thing about which, at least to a dweller in temperate regions, is that it is wholly concerned with the Lycaenidæ, of which eighty-two genera and over four hundred species are described. Such wealth in these pigmies among butterflies is a striking fact. The author, however, beyond the generic collocation, has made no attempt to classify this immense assemblage, contenting himself with only distinguishing certain groups of genera by the name of one of the included genera, as the "Thecla group," etc., which groups are characterised in a general but not formal way in the body of the work. These agree tolerably well with the groups Doherty had previously characterised from the egg alone, but are about twice as numerous and are established mainly upon the structural features of the imago. This is better than Distant's artificial divisions, but there is plainly an open field here for investigation, and one which there is apparently no need for great delay in occupying, since (excepting the egg) the early stages of Lycaeninæ appear to offer less service to the systematist than in any other group of butterflies.

What will surprise one in this volume, is the very considerable addition to our knowlege of the early stages of the Lycaeninæ, for excepting the Hesperidæ, this group is in general the least know of butterflies. Yet something is recorded of no less than thirty-four genera, much of it new, and in many a good deal of interesting history is related. This is a great improvement on the preceding volumes. One particular case, that of the pomegranate butterfly, whose history was briefly and partially given by Westwood, seems valuable enough to reprint for the benefit of American readers; and another, Curetis thetis, may well be mentioned here:—"The twelfth segment [of the larva] bears two most extraordinary structures, which consist of two diverging, cylindrical, rigid pillars, arising from the subdorsal region and of a pale green colour. When the insect is touched or alarmed, from each pillar is everted a deep maroon tentacle as long as the rigid pillar, bearing at its end long

*The Butterflies of India, Burmah and Ceylon. By Lionel de Nicéville, Calcutta. Vol. 3. 12+503 pp. 6 pl. 1890. 8°.

parti-coloured hairs, the basal third of each hair being black, the upper two-thirds white. The maroon tentacle with its long hairs spread out like a circular fan or rosette is whirled round with great rapidity in a plane parallel to the body, its use being almost certainly to frighten away its enemies, as this larva, as far as I am aware, is not attended by protecting ants and lacks the honey-gland on the eleventh segment present in so many lycænid larvæ which are affected by ants."

Ants have been found attendant upon half a dozen genera, and in many cases they have been identified by Dr. A. Forel, of Switzerland. At least a dozen species are concerned, and they are about equally divided between the Formicidæ and Myrmicidæ.

Spalgis, it appears, is another instance of a carnivorous lycænid comparable to our Feniseca, the larva associating with and feeding upon the "mealy bug" of the planters, a species of Dactylopius. De Nicéville in no way favors Edwards's belief that Feniseca belongs to the Lemoniinæ, and adds nothing, as we had hoped he might be able to do, to Holland's suggestion that Liphyra, too, might be carnivorous, though he points out that the two genera differ in their perfect state in the number of subcostal nervules, and are therefore not so closely allied as Dr. Holland thought.

The seasonal dimorphism of many Indian Lycænidæ is well brought out, the dry and wet season taking the place of our spring and summer; indeed, it occurs in no less than eighteen genera, and this will be a revelation to many, and seems to bid fair to renovate the study of tropical butterflies. But while in India proper, "the seasonal forms seem to be chiefly restricted to two, a wet and a dry," in the Himalayan district of Sikkim "the dry season form which occurs at the end of the year differs somewhat from the dry season form which occurs in the spring, so that with regard to some species there may be said to be three forms—a spring, a wet season, and a winter form." Sexual dimorphism on the contrary is very rare among tropical Lycænidæ, de Nicéville stating that he does not know positively of any case, though he suspects it in a species of Zephyrus. On the authority of Doherty (a native of Cincinnati by the way, working most industriously in the east,) he credits half a dozen or more species as mimicking others of the same or neighboring groups of Lycænidæ. Much attention is also paid to the secondary sexual characteristics so far as their gross appearances are concerned, and they are noted in no less than nineteen genera.

Finally, we may call attention to the very interesting general chapter on the Lycænidæ at the beginning of the volume, which is of more than usual interest and rather exceptional in a work of this kind. The work itself must serve a very useful purpose ; its execution is remarkably even and shows great skill and balance on the part of the author. There are half a dozen plates like those of the former volumes and executed by the same parties, excepting that two of them are chromo-lithographs, but we could wish that some plates of the early stages might have been added, and the direct purposes of the book for the Indian student would have been served by others giving structural details.

SAMUEL H. SCUDDER.

PARTIAL PREPARATORY STAGES OF ERYCIDES BATABANO, LEF.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

EGG.—Nearly spherical, the base flattened a little. Around the sides are eighteen vertical ribs, every other one shorter, not reaching the summit. The natural color could not be ascertained.

* * * * * * *

THIRD (?) LARVAL STAGE.—Head much larger than joint 2, flat before, broadly excavate at the summit, minutely granulated. Colot wine red, blackish on the lower third, with a large round orange spor before the eyes on each side. Width of head 2.5 mm. The body tapers to each extremity. Its color is wine red, with a darker shade over the dorsum centrally, and seven transverse orange stripes on the upper half of the body on joints 5 to 11, anteriorly, the posterior ones interrupted dorsally. Venter a little whitish. Length of larva about 10 mm. It forms a place of concealment in the manner of *Endamus tityrus* or *E. proteus* by folding over a portion of the leaf and securing it by threads.

FOURTH LARVAL STAGE.—Head much as before but the black shade is less and the granulations more distinct. Width 3.8 mm. Body marked as before ; very minutely pilose and with small semi-obsolete circular

spots. Spiracles small and whitish. The cervical shield covers the upper half of joint 2, is smooth and wine red. Length of larva 20 mm. When disturbed, it ejects from its mouth a large quantity of dark red fluid.

Fifth Larval Stage.—Mature larva. Head pale brown, blackish around the mouth with a large round orange spot before the eyes. It is granulated and pilose, the hairs small, and appearing frosted on the upper part of the head. Width 6 mm. The body is much contracted, and much smaller at the extremities. Cervical shield pale brown, smooth, hidden when the insect is at rest. Joint 2 is pinkish below. The body is bright frosted white, thickly covered by little circular depressions, in the centre of each of which is a minute frosted hair. These hairs are longer on the anal plate, and the depression there less deep. Thoracic feet pale brown. Venter and abdominal feet white, without the marks of the dorsum. Length of larva 40 mm., greatest width of body 12 mm., greatest height 10 mm., width of joint 2 4.5 mm. Its place of concealment, at this stage, is formed of several leaves spun together and lined with silk. Immediately after the moult, the body is colored as in the previous stage, but the white color appears gradually in the course of several days.

The leaves the larva has spun together serve as its cocoon, and the pupa is held by several transverse threads around the body, with the cremaster fastened in others.

Pupa.—Robust; abdomen large, eyes prominent. Two short prominences on the head between the eyes. The leg and antennæ cases form a point extending below the wing cases. Cremaster excavate below, with ridges at the sides above, curved downward, blunt, and terminating in a number of brown hooks. The pupa has many small, rounded depressions, and is minutely pilose. Color creamy white, a greenish tint on the thorax and cases, and a yellow stripe on the upper part of the eye. Length 32 mm., diameter of the abdomen 10 mm., diameter of thorax 9 mm., width through the eyes 6 mm.

Food Plant.—Mangrove, *Rhizophora mangle;* larvæ from Dade Co., Florida. I am not sure that the larval stage here first described is the *third*, but consider it most probable.

Mailed October 6th.

The Canadian Entomologist.

VOL. XXII. LONDON, NOVEMBER, 1890. No. 11.

PROCEEDINGS OF THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

(Continued from page 199.)

The Club met again at 5 o'clock, August 20th. Mr. J. Fletcher presented some notes upon injuries caused by the Hessian Fly, the Wheat-stem Maggot and an undetermined species of Oscinis. He said that the note was presented with the object of eliciting further information upon a subject which had proved of great interest to him. During the past season he had endeavored to determine the number of broods of the Hessian Fly for the Ottawa district, and had found, first, that the Hessian Fly, the Wheat-stem Maggot and Oscinis were all found at the same time and in the same plant, and further, that, speaking generally, they passed through their stages contemporaneously. Of the three the last had proved much the most destructive. From root shoots of wheat sown on the 14th of April he had bred Hessian Fly and Oscinis at the end of June, and a month later Meromyza had appeared. He had also noticed in some fields at Ottawa that a large quantity of spring wheat was attacked by Hessian Fly in the ground shoots, or stools, in the same manner as fall wheat is attacked in the autumn. It was frequently the case that on plants which had made from fifteen to twenty stools but one would be left, all the others having been destroyed by the insects. He had procured adult Hessian Flies at Ottawa during this season in the beginning of May, at the end of June, and in August, and they would probably appear again in September. He had not been able to find the Hessian Fly breeding in any of the grasses, and would like to know if others had done so. Meromyza and the Oscinis had been most troublesome pests in the experimental grass patches at Ottawa, some grasses being almost exterminated by them. It was remarkable that the spring appearance of Meromyza had been so enormous as to have caused fear of a serious destruction of the wheat

crop. As a matter of fact, however, there had been less injury, both to small grains and grasses, than for many years previously. This diminution he could only explain by the supposition that the eggs had been destroyed by some predaceous insect. The eggs must have been laid in large numbers, but there was very little evidence of the presence of the larvæ, either in the standing wheat or barley, or in the root-shoots of barley. The Oscinis he had been unable to identify; but, through the kindness of Mr. John Marten, of Illinois, he had learnt of some work which had been done by Prof. Garman in Kentucky, upon what was probably the same species. This, Mr. Marten said, had been doubtfully identified by Dr. Williston as *O. variabilis.*

Prof. Garman stated that he had studied what appeared to be the same species, and had prepared an article for publication. He also gave some notes upon the life history and anatomy of the insect.

Prof. Osborn had taken at Ames, Iowa, numerous specimens of Oscinis, one of which closely resembled that exhibited by Mr. Fletcher.

Prof. Alwood had studied in Ohio an Oscinis infesting oats, and had published his results in Bulletin 13, Division of Entomology. He had found the eggs, from two to eleven in number, were forced beneath the sheath of the leaf, and that just prior to pupation the larva gnawed through the epidermis and the pupa protruded so as to admit of the easy escape of the adult.

Mr. Fletcher, referring again to Meromyza, stated that in many instances he had found the egg deposited in the field upon the upper surface of the leaf some distance from the stem, and asked if others had observed this to be the case elsewhere.

Prof. Garman had found that the eggs were laid just above the sheath, or sometimes pushed beneath it.

Prof. Webster stated that the eggs of the Hessian Fly had, in the spring of the present year, throughout Southern and Central Indiana, been deposited near the roots, the "flax-seeds" being found in that portion of the plant; while in the northern part of the State the case had evidently been different, as the "flax-seeds" were there almost invariably located about the second joint.

The Secretary read a paper by Mr. Edward L. Graef, of New York, upon the American Silk Worm Moths or Spinners, in which a serious

attack upon the shade trees of New York by *P. cecropia* was recorded, and the suggestion made that this and other species might be turned to account, if any means could be devised for manufacturing and utilizing their silk. As a stimulus to this industry, Mr. Graef generously offered a prize of fifty dollars for the best essay and model of apparatus for carrying this suggestion into effect.

Thursday, August 21st.—The Club met at 8 a. m. Dr. C. M. Weed read an interesting paper upon the clover-stem borer, *Languria mozardi*. Fifteen species of plants were reported upon which the larva had been found feeding. This paper was discussed by Profs. Cook, Alwood, Osborn and others.

Prof. Alwood spoke of tobacco insects, of which he was making a special study. He had observed a stem borer which was very injurious.

Dr. Weed had learned of a tobacco root-louse in Southern Ohio.

Prof. Garman spoke of the mouth parts of several species of some families of Thysanoptera, and stated that some recent studies had shown him that the figures published did not agree with his material. He then read the following paper :—

AN ASYMMETRY OF THE HEAD AND MOUTH PARTS OF THYSANOPTERA.

In a brief paper in the Bulletin of the Essex Institute I have recently called attention to peculiarities in the structure of the head and mouth parts which set this group quite apart from other orders of Hexapoda. [This has no reference to affinities upon which, I believe, we are not prepared to pronounce until this and several other groups have been more completely studied.] In that paper it was claimed that the endocranium of the species examined was not symmetrical, being deficient on the right side ; that the labrum was one-sided ; that there was a developed mandible on the left side, with, at most, a rudiment on the right ; and that the mandibles of authors were probably lobes of the maxillæ.

At the time the paper was written I had not examined sufficient material to enable me to say whether the features pointed out were limited to certain species or were common to all members of the group. Since then many additional forms have been examined, all, however, belonging to the families Stenopteridæ and Coleoptratidæ, and in no case has there been found a departure in essentials from the structure of the head and

mouth parts as they were described in the paper referred to. It is probably safe to assume, threfore, that the asymmetry noted is characteristic of these two families at least.

Of the group Tubulifera no representatives have been studied. I shall not be surprised, since this is the lowest of the suborders, if examples of Phlæothrips are found to be more nearly symmetrical.

As an interesting fact, though in no way related to the main purpose of this communication, I may mention that the solitary mandible of Limothrips and Melanothrips is perforate, like the jaws of larval Chrysopa, of Dytiscidæ, and of Myrmeleon. In specimens of Coleoptratidæ examined, both labial and maxillary palpi are composed of three segments.

Note.—Since my return to Lexington from the meeting of the American Association I have secured a couple of very young Phlæothrips. My examination of these is not completed, but I have succeeded in demonstrating the single jaw on the left side. The parts are greatly elongated, and remind one of the same organs in Hemiptera. The styliform parts are especially long, extending, when retracted, into the cranial cavity towards the eye, thence bending posteriorly and extending along the posterior wall of the head to the mouth-opening. Both mandible and styliform parts are perforate (or possibly grooved).

Two unmistakable tarsal claws are present in this genus. From their relation of position to the pads the latter would seem to be modified pulvilli.

Prof. Osborn was much pleased with what Prof. Garman had stated. He had also observed some of the points mentioned in a special study which he had made of these insects, and hoped Prof. Garman would publish his results as soon as possible.

Dr. Weed presented a short paper on the oviposition of *Listronotus latiusculus*. The eggs are laid in clusters of from five to ten upon the leaf stalks of *Sagittaria variabilis*, and are covered with small pieces of the epidermis which are nibbled off by the adult beetle. This was discussed by Messrs. Garman, Fletcher and Webster.

Mr. Charles Robertson, of Carlinville, Ill., read a most interesting note upon the habits of the bee *Emphor bombiliformis*, which was originally described by Cresson as a *Melissodes*, but Paton, in revising the

genus, raised it to *Emphor*. This bee, it was stated, confines itself almost exclusively to *Hibiscus*, chiefly *H. lasiocarpus*. The appearance and habits of the bee were described. It was stated that in collecting these bees it is important to catch those flying around the plant without alighting, as these were generally the males, whilst those visiting the flowers for honey and pollen were the females. On August 5th, when walking along a dam with water on one side, he had noticed a female standing upon the water; she then flew to a bank, and he observed that she was carrying water to facilitate the excavation of hard ground, into which she was burrowing to build her nest. Sometimes one pellet of earth would be taken out after such an application of water, but at others three or even four. An interesting discussion followed which was participated in by Messrs. Osborn, Cook, Weed, Fletcher and others.

Prof. Osborn read the following note "On a Peculiar Form of Coleopterous larva":—Eleven years ago, while a student in college, I found a peculiar form of larva boring in the twigs of ash trees, and it was described at the time in the students' journal at the college (The Aurora, May, 1879, page 5,) under the caption "A Grub With Legs on its Back." The description is as follows: "The specimen was found boring in the pith of a small twig on an ash tree near the road west of the college, apparently beginning at or near the tip of the twig and working downward. Numerous twigs were found that had been inhabited in this way, but only one specimen of the borer was found—this about a quarter of an inch long, quite slim, and nearly white. Its great peculiarity consists in the disposition of its locomotive apparatus. The first three segments following the head are provided with the usual pair of legs, each in the normal position—that is, on the ventral surface. The following six segments are provided each with a pair of pro-legs, similar to those found on many caterpillars, but, strange to say, these are arranged upon the *dorsal surface*, exactly the opposite of the usual arrangement, while the number six is different from either the caterpillars, where there are four or five, or the saw-fly *larvæ*, which have eight. The remaining three segments have no propellers whatever. The beauty of this arrangement, for the conditions of the borer, can at once be seen, for it has as much foot-hold above as below. Placed upon a flat surface it could make no advancement, but wriggled awkwardly about, evidently seeking its double foot-hold. Placed between two thin plates of glass, it moved rapidly, using all its legs, and

going with equal facility backward or forward, either side up. If provided with some support at one side it was possible for it to travel by means of the legs on its dorsal surface alone."

During the present season an example of a similar larva has come to my notice, specimens being first observed by Prof. L. H. Pammel, occuring in the stems of *Helianthus*. Their possessing similar locomotive organs upon the back called to mind the peculiar larva noticed years ago. They differ, however, somewhat in colour as well as in the plant on which they occur, and I find that they attacked voraciously dipterous larva that were living in the same stems. Whether they are normally carnivorous remains of course to be determined, but there can be no question of their attacks upon these larvæ, and apparently with the intent of obtaining food from them. These specimens are of a light bluish colour, possessing prolegs upon segments 4-9, inclusive, and a pair of tubercles on the ventral portion of the anal segment, as well as a dorsal tubercle on the terminal portion of the same segment. In general appearance there is a striking resemblance to the *Languria* larva, as shown in figure exhibited by Dr. Weed, but in his drawing there is no indication of the dorsal feet.

The Club convened at 5 p.m., and considered the following resolution :—

Resolved, "That it is the sense of the Club that the meetings of the Association of Economic Entomologists and of the Entomological Club would both be benefited by holding such meetings, if possible, at the same time and place as the meeting of the American Association for the Advancement of Science."

After discussion by Messrs. Fletcher, Osborn, Cook, Alwood, Weed and others, the resolution was unanimously adopted.

The Secretary read a paper by Prof. D. S. Kellicott, of Columbus, O., upon the "Preparatory Stages of *Eustrotia caduca*." He had collected the larva upon *Nuphar advena* at Rives Junction, Michigan, in 1876. From these he had bred a moth, afterwards named by Mr. Grote *E. caduca* in the CANADIAN ENTOMOLOGIST, Vol. 8, p. 207. During July of the present year he had again collected the insect at Corunna, Michigan, and had succeeded in breeding and describing all the stages, which were submitted herewith.

The larvæ found in 1876 were feeding in the fruit, but those studied

during this summer were found upon the leaves. If these latter were floating, the larvæ were exposed on the upper surface, in other cases they were beneath or concealed in folds. A different habit of swimming to that of *Arzama obliquata*, which progresses by horizontal undulations was noted. *E. caduca* swims strongly, but by an entirely different motion. The posterior third of the body is bent downwards like the tail of a crayfish and then quickly pushed backwards, thus driving the insect ahead by jerks.

Discussed by Messrs. Weed, Webster and others.

Prof. Cook reported having bred *Agrotis C-nigrum* through all its stages upon black currant, the eggs having been laid in a cluster upon leaves of that plant on 1st of June—the perfect insect appearing on the 1st of August.

Prof. H. Osborn read a note on the "Period of Development in *Mallophaga*." The habits of the species of *Mallophaga* render accurate observations upon the time required in development of the eggs a matter of considerable difficulty. While in some of the species upon very common birds it is possible to get an abundance of material, in other cases the opportunities for obtaining such material are very rare. But in the most common species the difficulty of determining the exact time of deposition of eggs, and then of keeping individuals in such conditions as to insure a normal development, makes positive observations difficult. This being the case, any observations which may add to our knowledge of the subject seem of interest, and the present note is offered as one such contribution.

The species chosen in the present case is the *Nitzschia pulicare*, which is almost invariably to be found in abundance on the common chimney swift (*Chætura pelasgia*). This bird is an abundant resident of the building in which my laboratory is located, and being readily obtained on account of its tendency to fly in at the windows, I suggested to Mr. P. H. Rolfs, a graduate student in biology, that he attempt the rearing of larvæ from eggs with a view to determine length of developmental period in connection with studies of its embryology.

For this first purpose he secured on two separate occasions a number of the eggs, and kept them, part in a tight paste-board box, which was kept warm by the heat of his body, the others were enclosed in

cotton-plugged tubes under a hen that was kept in the laboratory at the time for incubating eggs for embryological work. Of the first lot, all kept in pocket, secured July 27th, two eggs hatched Aug. 4th, five between Aug. 8–13th, one Aug. 16th, the last giving twenty days, the longest period.

Of the second lot secured, Aug. 3rd, six hatched between the 8th and 13th, four hatched Aug. 14th (three in box and one in tube), two Aug. 15th (one in box and one in tube), part not hatching, and the longest period in this case being thirteen days.

Assuming that those requiring the longest time had been deposited but a short time before the experiment began, we should have from fifteen to twenty days as the ordinary time required for the eggs to hatch for this species.

Mr. F. S. Earle presented some interesting notes upon the injurious insects of the season in Southern Mississippi. *Diabrotica 12-punctata* was a very abundant insect, and in addition to its well known food plants it had been a serious pest to peach trees and cabbages. Leaves of the latter, bitten by the insect, at once decayed from the point of injury. Cut-worms were very destructive in gardens, and cucumber and melon vines were much injured by a plant-louse. Potatoes had been much attacked by a black flea-beetle, and the tomatoes by the boll-worm in the fruit, and on the leaves by the sphinx larvæ.

Prof. Cook would like to hear the experience of those present as to a practical remedy for the attack of the boll-worm upon the fruit of tomatoes.

Prof. Osborn said that Mr. Tracy had tried arsenical mixtures with some success, and also had attracted the perfect insects to light.

Miss M. E. Murtfeldt read the following paper :—

SOME EXPERIENCES IN REARING INSECTS.

In rearing insects, as with many other enterprises in life, we climb the ladder to success by the rounds of successive failures, having in many cases to exhaust an almost infinite range of "how *not* to do it," before arriving at its happy converse.

Many and great are the disappointments of the entomologist; but does he succumb? Never! What single point in the biology of a species has been relegated to the absolutely undiscoverable? I do not

know of one, no matter how obscure the subject or how little advance has yet been made in the direction of its elucidation.

"Hope springs eternal" in the breast of the entomologist, and patience and perseverance have in him their "perfect work," until Nature relents, or is caught "off guard," and the secret, so carefully hidden, is revealed.

I am tempted to enumerate some of the discouraging circumstances encountered by the biologist in this field.

Among the *Lepidoptera*, a majority of the *Bombycidæ*, *Geometridæ* and *Noctuidæ* adapt themselves readily to the conditions of the rearing cage. They accept the food provided and make the best of it, even after it has become a little dry, which must sometimes occur when the caretaker is pressed for time. They thrive in the closer and darker air, and take such exercise as they require within their narrow walls of glass and wire-cloth, and when the metamorphic impulse comes they contentedly weave their cocoons in the corners of their prison, or bury themselves in the two or three inches of cemetarial earth in the bottom of the cage, and safely pass those mysterious transformations which give to this class of beings their pre-eminent interest.

But there is a great deal of individuality, or rather, specificality, in insects, and not infrequently specimens of larvæ are found for which the collector taxes his ingenuity in vain to provide. Not the freshest of leaves, the cleanest swept earth or the most well-aired of cages will seem to promote their development. They wander about the cage with an exhausting activity that pathetically suggests a realization of their imprisoned condition. They nibble languidly at their food, and aimlessly spin mats of web in inconvenient places, over the cracks of the door or cover, for instance, and, before long, comes the morning when they are discovered dead and discolored in the bottom of the cage, *and no more of them to be obtained until another season.* Or perhaps the cocoons are spun or the transformation to pupæ safely effected under ground, and the entomologist has full confidence that in due time he will obtain the much desired imago, and, when it may be expected, watches hourly for its emergence, and is rewarded by the appearance of an *Ophion* or a swarm of *Tachina* flies, or of some still smaller enemy, whose existence he did not even suspect.

Again, the collector may be obliged to delegate his cares temporarily

to another, who, unused to the almost constant supervision necessary, suffers the precious larva to starve, or, by an oversight, tosses it out with the withered leaves, or crushes it in the hinges of the door, or, still more aggravating, thoughtlessly raises the cover and allows some long looked for imagine to dart out and escape through an open window. All that he will remember for the benefit of the person chiefly concerned, will be that it was a moth and "seemed something peculiar." As the entomologist cannot afford a separate cage for each species, and as he had probably put his choice unknown in with some well known forms of which he wishes simply to increase his duplicates, he probably grasps at the hope that the escaped insect was one of the latter, and so defers the full realization of his loss until weeks and months have passed and all his expected species have emerged, and then he hopes for better success another year, and finds "life well worth living" for this and similar reasons, which only an ardent naturalist can appreciate.

In some respects too much care is as subversive of success as too little. For instance, the very natural curiosity which the student feels to examine into the state of the insect after it has been buried for a short time in the earth. So he sifts the soil in his cage, and though he handles it with all caution, the frail earthen cell in which his treasure is enclosed falls in pieces, and the poor caterpillar in complete helplessness squirms in the loosened earth. Despairingly he tries with clumsy fingers to reinclose it in the fragments of its cell, or attempts to form a substitute by packing the earth so that it may not be smothered. In vain. In ninety-nine cases in a hundred he never sees the imago.

While the hardy pupæ of most noctuids will bear any amount of handling, and by their activity will beat hard the earth about them at any time, a few species absolutely resent the least disturbance. I think that for seven or eight successive years Dr. Riley and I tried in vain to obtain the imago from a beautiful larva found every autumn in greater or less numbers on *Gnaphalium*, and occasionally on the Asters and some other *Compositæ*. Not being able to associate it with its species we designated it the "pretty cut-worm." It was Dr. Riley's practice to have the earth in his cages sifted occasionally during late autumn and winter to see how the pupæ were fareing, and to have each species collected into its particular corner or side of the cage, which was designated by the label on the door.

But in the case of this particular species this orderliness was fatal. After Dr. Riley went to Washington, I resolved on the "let alone" policy. I put the larvæ into a cage with clean earth with an admixture of sand which I dampened slightly and only at considerable intervals during winter, kept the cage in a very cool place, and the next summer was rewarded with several fine specimens of *Mamestra legitima*, my only disappointment being that it was a species by no means uncommon.

With me *Scopelosoma sidus* behaved in an almost equally capricious manner, but was, after many trials, finally reared by adopting the same methods as with *legitima*. I now make it a practice to sift or change the earth in my cages only in the spring and autumn before the hibernating pupæ are formed. Of course, if I wish to note pupal characteristics, I have to run the risk of the disturbance, but this is only occasional. I have found that frequent dampening, when the cages are kept in doors, is also detrimental, and that hibernating larvæ and pupæ are far less likely to suffer from drought than from dampness.

In rearing the Micro-lepidoptera—in which I have an especial interest—various tactics must be pursued, and the imagination is often vainly taxed to suggest a provision which the delayed changes and general unrest of the insect plainly call for.

Under natural conditions it is very difficult to keep track of these small creatures. The leaves or flowers or fruits on which they may be found feeding on one day will be deserted by the next, and during the darkness they will have betaken themselves to parts unknown, the most assiduous search failing to discover them. In the rearing jar some species adapt themselves very kindly; others will crawl about for days spinning threads of silk over sides and cover and finally dry up without effecting their transformations.

An accident to which the student is liable, and against which he can with difficulty make provision, is to have the larva, which he has perhaps just described and figured, escape. How often have I taken up a bottle in which I had been rearing a particularly precious unknown, and found a tiny hole in the muslin cover, or perhaps a little flap cut at the edge of the bottle, telling only too surely of the loss and delay which a further examination verified. The annual brooded species which appear in the spring are the *beteis noir* of the Micro-lepidopterist, especially such

species as pupate on or just beneath the surface of the ground. They have to be cared for during the long, hot summer, as well as the autumn and winter, and to keep the safe middle course between the Scylla and Chaybdis of drought and of the dampness which would promote the equally fatal mould, requires the most careful attention. The annual brooded species which later fold or mine the leaves, or feed in the fruit capsules of various plants, or bore the stems, are comparatively easily reared, with a few exceptions. It was a number of years before I succeeded in obtaining the moth from an interesting larva which fed in the capsules of *Pentstemon*. This was owing to the peculiar change of habit during hibernation. After eating all the seeds from both divisions of the capsule, it would thoroughly line one all with silk, after cutting an aperature for escape, and ensconce itself, as might reasonably be supposed, for its winter's sleep. But no ; the neatly lined cell was only a temporary abode, which, during the inclemency of mid-winter, was to be deserted for an entirely different one. Where, in the state of nature, I have not yet been able to discover. In my rearing jars it perished, year after year, to my inexpressible disappointment, until finally I wintered a number out of doors in a small wire cloth box closed with a cork. From this collection I at last obtained the moth—a beautiful *Conchylis*—from a larva that had bored into and transformed within the cork. But for two or three years I had only the single specimen, and next to the aggravation of utter failure I rank the possessor of an unknown unique. It may be new, and if sent to a specialist he will generally feel somewhat aggrieved if you reserve the right of description and further impose upon him the duty of returning the specimen. Then there is the danger of its destruction, either in the mail or express, to be braved, and yet, so long as one does not know the species, or be assured that it is new, one never can take full satisfaction in having bred it.

Last year I had the satisfaction of obtaining nearly a dozen imagines of the *Conchylis* in question by providing a number of bits of pith and cork in which the larvæ bored after their desertion of the capsules where they had fed.

Wherever I can make satisfactory arrangements for keeping track of them, I winter my Micro-larvæ and pupæ out of doors. Such species as bore the pith of stems are very easily cared for, and leaf miners and webbers I enclose on the surface of the ground, in some sheltered situa-

tion, under wire sieves or covers, bringing them in in the spring in order to have the little moths emerge where they can more easily be chloroformed or transferred to the cyanide bottle.

I must confess that I have never had signal success in rearing such species of the *Tenthredinidæ* as transform under ground. I have in mind more than a half dozen species—the larvæ of which are most interesting—of which I have so far failed to obtain the imagines, in spite of my utmost care.

The leaf and root-feeding beetles have always developed satisfactorily for me, but the *Cerambycidæ*, which feed on growing wood, have given me much trouble, and, in many cases, failed me utterly.

Orthoptera require but little care, as also do leaf-feeding *Hemiptera*, but the Cannibal species of both these orders are more difficult to cater to, and often refuse a diet that one would think would be irresistible. This is especially true of the carnivorous bugs which I have found require large space and ample provision to preserve them from fraternal rapacity.

With the aquatic orders I have had but little opportunity for experiment, but think they must furnish many very interesting subjects.

I believe that costly insectaries are being constructed by many entomologists, and no doubt will afford room for much thorough study of forms and habits. But such costly appliances are not absolutely necessary, and sometimes make observations more difficult than when the conveniences are more primitive.

A secure enclosure, fresh food, fresh air and clean water in the bottles are almost the only requisites in rearing the herbivorous species, and the more constantly the cage or jar is under observation the more thoroughly of course are the history and habits of the species revealed to us. When I wish to know all about a species, I keep the cage or jar on one corner of my desk and watch its occupant in the intervals of other work.

I cannot hope that I have conveyed much information in these notes to those who have gone over the same ground, but I am at least sure that I have recounted some of the experiences of every biological student of insect life, and can sympathise in his disappointments and appreciate the satisfaction of his successes.

Friday, August 22nd.—The Club met at 8.30 a. m. Dr. Weed presented a short paper on the habits of *Lixus concavus*.

As reported in the bulletin of the Ohio Ex. Station, Mr. Alwood had found this insect injuring the stems of rhubarb. During the past summer he had bred it from all parts of the stem of the common curled dock.

Prof. Alwood stated that he had observed the larvæ of *Gortyna nitela* eating those of *Lixus*.

Dr. Weed read a paper upon the habits of *Psephenus Lecontei*.

Prof. Webster and Mr. Fletcher also spoke on the habits of this beetle.

Prof. Hargitt read a note upon a large foliaceous gall which destroyed the tips of the stems of various species of *Solidago* at Bloomington, Indiana. In many instances as many as ninety-nine per cent. of the flower stems had been destroyed.

Prof. Hargitt read a note upon the Canker Worm. He said: "My attention was drawn to an orchard near Oxford, Ohio, which, for three or four years, had been seriously affected by this pest. In May, 1890, I went to examine the orchard and found it thoroughly over-run by the larvæ, many of the trees being actually dead, and several others in a very weak condition. The orchard, viewed at a distance, had the appearance of having been burned, the leaves being brown and dead. The trees were most attacked upon the outer rows, particularly those adjoining a wood. I recommended spraying with one of the arsenites, but it was too late for the present season. I observed several small birds in the orchard actively engaged in feeding upon the larvæ, amongst them the cedar bird, blue bird, summer warbler, chipping sparrow and field sparrow."

Prof. Hargitt also read a note upon *Cermatia forceps*. He had found that this Myriapod had become abundant in houses and the college building at Oxford, Ohio, during the past two or three years. He had experienced the same difficulty in keeping the insects alive in captivity, as was mentioned by Dr. Lintner in his 4th Report. He had succeeded in keeping them for several days and inducing them to take prey by keeping them in dark quarters in a tin canister during the day. When so confined they had fed freely upon house-flies, and other insects supplied them.

Prof. Webster spoke of the predaceous habits of *C. forceps*, and its special fondness for the Croton-bug *(Ectobia germanica)*.

Mr. Fletcher had observed the insect when visiting Mr. Howard at Washington, D. C., who had described to him its remarkable habit of capturing the Croton-bug by springing over it and thus encaging it beneath its many curved legs. He was of the opinion that those who had failed to keep this insect in captivity had done so from omitting to supply a sufficiency of moisture, and thought that Mr. Hargitt's success in the instance mentioned, where the insect was put in a tin can, was more due to this cause than to the darkness. *Myriapods* are generally found in damp, dark places.

The Club proceeded to elect officers for the ensuing year. Prof. Cook, the retiring President, congratulated the members upon the harmony which had existed throughout the sessions, and was glad to find that, although some old and pessimistic members of the Club had predicted that it had run its course and would soon flicker out like a spent candle, he was glad to find that the present meetings had not only been the best attended for many years, but that the discussions and papers had been equally interesting to those of any meeting which he had had the pleasure of taking part in. He wished the Club every success and trusted that it would grow stronger and stronger every year. The following officers were elected :—

President, Prof. Herbert Osborn, Ames, Iowa.

Vice-President, Miss Mary E. Murtfeldt, St. Louis, Mo.

Secretary, Dr. C. M. Weed, Columbus, Ohio.

Prof. Osborn, at the invitation of the President, introduced the subject of the use of contagious diseases in combating injurious insects. He said that he had already published a paper in the Transactions of the Eastern Iowa Horticultural Society for 1886, pp. 400–405, upon this subject; but that it was of such importance that he desired to hear it discussed by the members of the Club. He first mentioned the well-known fungous and bacterial diseases which attack insects, as Muscadine, Grassen or Jaundice, Pebrine, Flacherie or Flaccidity, Foul-brood of Bees, Fly and Grasshopper Fungus, and the White-grub Fungus, and called attention to the fact that we were already able to control those which affect important domestic species, as Silkworms and Bees, and that to some extent at least we are able to control those available as agents in destroying

injurious species. After considering the various conditions limiting the applicability of this means, he drew the following conclusions :—

(1) That there are diseases amply sufficient as a basis for economic work, the bacterial forms giving the most promise for all cases where early results are desired, while those due to fungi, so far as present knowledge goes, propagating slowly, can only be used as slow but efficient checks to injurious forms, the most that we can do with them being to introduce them in localities where they are not already found.

(2) That the diseases can be controlled to the extent of preserving the germs for a season and transporting them from place to place to use for inoculation, but that their spread in nature will be affected by conditions beyond control, while only such insects as occur gregariously, or live in mingled hosts, can be attacked to advantage.

(3) That the cost of application would prevent its adoption except in certain forms.

(4) That we must consider this method of contending with insects at best as but one of a number of profitable methods to be used in certain cases where other methods are insufficient, and to supplement other methods when it can be done to advantage. With this end in view, the diseases of insects are worthy of the most careful study, and will not, he thought, disappoint the investigator in their final results.

Mr. Fletcher thought that the chief difficulty with regard to these fungous diseases was their cultivation so that they might be available at the time when needed. One trouble with him had been carrying them over the winter.

Prof. Hargitt spoke of a fungous disease which had attacked the canker worm.

Prof. Cook thought the greatest difficulty in making use of contagious diseases for the destruction of insects was the fact that the insects which it was desired to treat were not always in a susceptible condition.

Prof. Garman thought that although fungous diseases were difficult to introduce, bacterial diseases would probably be more controllable.

The meeting adjourned till 5 o'clock.

Prof. Atkinson spoke on the "Injurious Insects of Alabama." A bud worm had been extremely injurious to young corn, piercing the central shoot and destroying its growth. *Diabrotica 12-punctata* had

also been injurious in the same manner; and, if there were not sufficient food in the stem, the larvæ descended to the roots and tunnelled out irregular channels on the surface. They pupated in the ground. A new attack had been observed on the "Irish potato," viz , by the Cabbage Plusia, which had attacked the leaves. The same insect had been very injurious to cabbages. In the Southern part of the State more harm had been done by the Plusia than by the cabbage worm. At Mobile farmers had complained that 50 per cent. of their melons had been injured by a worm. *Scolytus rugulosus* had been very abundant at Auburn in the spring, attacking trunks which appeared to be perfectly sound. Onions had been badly injured by a species of Thrips. Another species had also been injurious to cotton plants.

Prof. Cook stated that he had also seen a Thrips injuring onions in Michigan.

Prof. Webster stated that he had studied *Scolytus rugulosus* and had found that it invariably attacked trees which were injured. In a single instance, where the beetles had commenced operations on a sound tree, he found that they afterwards left it.

Prof. Cook made some remarks upon the effect of mild winters upon insect presence. He had found cut-worms and saw-flies very abundant in Michigan during the present season. He had also bred a new borer from the black currant, *i. e.*, the small longicorn beetle *Hyperplatys maculatus*. He had also found that the larvæ of *Aegeria tipuliformis* had been largely destroyed by a fungous growth like that of the white grub. The leaves of cherry, pear and quince had been badly attacked by the larvæ of saw-flies, but they had been easily kept in check by applications of road dust.

Dr. C. M. Weed presented a paper upon the "Oviposition of *Dectes spinosus* upon *Ambrosia trifida*." He also gave some account of the insect, in all its stages, from specimens which he had bred.

During the meeting a most interesting set of photographs was exhibited by Prof. Webster, showing a likeness of Thomas Say, his birthplace, the house where he lived during the greater part of the time he was writing his works, his tomb and an autograph. Prof. Webster had a few sets of the photographs struck off when his own were printed and is willing to let entomologists have them at the actual cost of production.

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 208, Volume xxii.)

H. roseata Wlk.

1866—Wlk., App. to Lord's Trav. in Vanc., 336 (?), *Halisidota.*

cinnamonea Bdv.

1868—Bdv., Lep. Cal. (Ann. Soc., Belg., XII.), 80, *Phægoptera.*

1869—Grt. & Rob., Trans. Ann. Ent. Soc., III., 175, *pr. syn.*

Habitat—Vancouver, Calif.

As the description of this species is not readily accessible to students, I reproduce it here :—

"Female rosy red; body densely clothed, and partly pale yellow beneath; head with a pale yellow band on the front; palpi extremely short; thorax with six longitudinal pale yellow streaks; abdomen rosy, lanuginous and partly yellow to the base, extending much beyond the hind wings; fore wings with some pale yellowish streaks toward the base, with three exterior whitish macular, very oblique bands; spots mostly cuneiform; costa straight; tips slightly acute; exterior borders slightly convex, extremely oblique; first and second inferior veins contiguous at the base; third very near the second; fourth remote from the third; hind wings whitish cinereous, slightly hyaline; veins and fringe slightly yellowish. Length of the body, 7 lines; of the wings, 20 lines.

"This species may form a new genus. It differs somewhat from *Halisidota* in the structure of the veins of the fore wings."

H. scapularis Stretch.

1885—Stretch, Ent. Amer., I., 106, *Halisidota.*

Habitat—New Mexico.

H. significans Hy. Edw.

1888—Edw., Ent. Amer., III., 182, *Halisidota.*

Habitat—New Mexico.

H. sobrina Stretch.

1873—Stretch, Zyg. and Bomb., 87, 135, pl. VI., f. 10, ♂, *Halisidota.*

1873—Edw.*, Proc. Cal. Ac. Sci., V., 369, *Halisidota.*

Habitat—California.

Food-plant—*Pinus insignis.*

H. tessellaris Sm. Abb.

1797—Sm. Abb.*, Ins. Ga., II., 149, pl. 75, *Phalæna.*

1816—Hbn., Verzeichiss, 170, *Halisidota.*

1837—Geyer, Zutr., No. 470, ff. 939–940, *Halisidota.*

1833—Harris, Cat. Ins., Mass., 592, *Arctia.*

1841—Harris*, Rept. Ins., Mass., 260, *Lophocampa.*

1856—Wlk., C. B. Mus., Lep. Het., III., 732, *Halisidota.*

1860—Clem., Proc. Ac. Nat. Sci., Phil., XII , 534, *Halisidota.*

1862—Morris, Synopsis App., 348, *Halisidota.*

1862—Harris*, Inj. Insects, 364, *Lophocampa*

1863—Saund.*, Syn. Can. Arct., 19, *Halisidota.*

1864—Walsh*, Proc. Bost. Soc. N. H , IX., 289, *Halisidota.*

1870—Walsh*, Am. Ent., I., 205, *Lophocampa.*

1873—Stretch*, Zyg. & Bomb , 87, 137, pl. VI., f. 9, ♀, *Halisidota.*

1882—Grote, New List, 16, *Halisidota tessellata.*

antiphola Walsh.

1864—Walsh*, Proc. Bost. Soc. N. H., IX., 288, *Halisidota.*

1864—Walsh*, Proc. Ent. Soc., Phil., III., 412, 413, *Halisidota.*

1864—Grt., Proc. Ent. Soc., Phil., III., 536, *pr. syn.*

1865—Walsh, Proc. Ent. Soc., Phil., V., 197, *pr. syn.*

var. harrisii Walsh.

1864—Walsh, Proc. Ent Soc., Phil., III., 430, *Halisidota.*

1865—Walsh, Proc. Ent. Soc., Phil., V., 197, *pr. var.*

1870—Walsh, Am. Ent., I., 205, *Lophocampa,*

1873—Stretch, Zyg. and Bomb., 137, *pr. var.*

Habitat—Canada to Texas; Illinois, Indiana, Missouri.

Food-plants—Oak, sycamore, beech, hornbeam, plane.

H. trigona Grt.

1879—Grt., No. Am. Ent., I., 46, *Halisidota.*

1881—Grt., Trans. Kans. Ac. Sci., VII., 64, *Halisidota.*

Habitat—New Mexico.

Genus EUHALESIDOTA, Grt.

1865, Grt., Proc. Ent. Soc., Phil., V., 243.

Head moderate; eyes large, not prominent; tongue of medium length, corneous; palpi short, scarcely exceeding the front; terminal joint very short; antennæ long, in the male heavily pectinated; legs increasing in length posteriorly; spurs normal in number and moderate in length.

In venation I can find no notable differences from *Halisidota*, and the only examined species, *longa*, alone considered, I cannot find *any* difference save in the wing form. In *Euhalisidota* the primaries are longer and more pointed. Mr. Grote, in describing the genus originally, had only a single rubbed female before him, and pointed out some distinctive characters which seem inconstant.

E. longa Grt.

1880—Grt., Can. Ent., XII., 213, *Euhalisidota*.

Habitat—Florida.

E. pura Neum.

1882—Neum., Papilio, II., 133, *Euhalisidota*.

Habitat—Arizona.

Genus Alexicles, Grt.

1882—Grt., Trans. Kans. Ac. Sci., VIII., 46.

Eyes hairy, head produced; the thick clypeal vestiture conceals the small palpi; abdomen short, male antennæ pectinated; wings rather long and narrow, entire, sub-diaphanous. Cell in primaries closed, veins 3–5 arising near together.

The above genus is unknown to me, and the characters given are from Mr. Grote's description, and all that he gives. He says, "In placing it among the *Arctians* I have probably not found its best place." No family characters are given, so it is impossible to guess where the genus belongs. The neurational characters given are as much *noctuid* as *arctiid*, while the origin of vein 8 of secondaries, which would have probably decided the propriety of its reference to the *Arctians*, is not mentioned at all. In fact, except by the identification of the species, the genus is not recognizable. The species is *A. aspersa* Grt.

1882—Grt., Trans. Kans. Ac. Sci., VIII., 46., *Alexicles*.

Habitat—New Mexico.

I have now gone over all my notes in the family. The bibliography is probably not complete, but it embraces references to the descriptions of all the species and nearly all the genera. By far the greater number of references are original, and nearly all have been verified. The notes on the structural characters have gradually accumulated, as I rarely lost an opportunity of making an examination of a species coming into my hands, nor of noting the contents of books which I found occasion to examine in my studies on the *noctuidæ*. In arranging the *Arctiidæ* of

the National Museum collection it became necessary to examine some of the species for determination, and the facts gleaned in this way were noted. The localities given are very incomplete, as here I failed. I neglected localities for structure, and the list does not, therefore, give a fair idea of the distribution of many of the species.

The economic literature has been almost entirely omitted, since it rarely became necessary for me to refer to it. Mr. Hy. Edwards's list of the early stages will supplement the present catalogue in this respect. The object sought here is to bring within reach of the student the knowledge of where the literature of the family can be found, if he desires to study it systematically. I have also given my own observations which may serve as a starting point for others, and may aid in determination and a knowledge of the characters upon which the genera are based.

SYNOPSIS OF GENERA.

1. Front tuberculate or roughened 2
   Front smooth 3
2. Anterior tibia unarmed; accessory cell wanting ..... *Cydosia*
   Anterior tibia with a claw at tip; primaries with an accessory cell ..... *Cerathosia*
3. Vein 5 of secondaries wanting or very faint 4
   Vein 5 of secondaries present 5
4. Primaries long and narrow, secondaries broad and large .... *Emydia*
   Primaries broad, secondaries smaller, proportionate ..... *Crocota*
5. Vein 8 of primaries wanting; 11 veins 6
   Vein 8 of primaries present; 12 veins 7
6. Vein 10 of primaries from the subcostal; 3 and 4, and 6 and 7 of secondaries stalked ..... *Gnophæla*
   Veins 7 to 10 of primaries on a stalk out of the end of the cell; veins on secondaries not stalked ..... *Epicallia*
7. Vein 10 of primaries from the subcostal 8
   Veins 7 to 10 of primaries stalked out of the end of cell 13
8. Accessory cell present on primaries 9
   Accessory cell wanting on primaries 10
9. Antennæ of ♂ bipectinated ..... *Nemeophila*
   Antennæ of ♂ with single lateral bristles only.
   Primaries narrower, parallel, apices rounded; secondaries large, broad ..... *Utetheisa*

Primaries broader, trigonate, apices marked; secondaries proportionate ..... *Callimorpha*

10. Tongue weak and short 11
Tongue moderate or long 12

11. Fore tibia with a small spine at tip, wings broad and large.. *Euprepia*
Fore tibia unarmed.
Wings broad, size large ..... *Platarctia*
Wings moderate, size smaller ..... *Arctia* / *Callarctia*

12. Primaries broad, apices not produced, secondaries proportionate ..... *Euchætes*
Primaries broad, apices produced, acute, secondaries small ..... *Eupseudosoma*
Primaries narrow, with greatly produced apices, secondaries still smaller ..... *Halisidota* / *Euhalisidota*
Primaries still narrower, size smaller ..... *Nelphe*

13. Vein 8 of secondaries wanting ..... *Euerythra*
Vein 8 of secondaries present 14

14. Median spurs of hind tibia wanting 15
Median spurs of hind tibia present 18

15. Anterior tibia armed at tip 16
Anterior tibia unarmed at tip 17

16. Tibial armature consisting of a long claw ..... *Seirarctia* / *Ectypia*
Tibial armature consisting of a stout spine each side of tip; ♀ antennæ pectinated ..... *Leucarctia*
Tibial armature consisting of a small spine at each side of tip; ♀ antennæ simple ..... *Hyphantria*

17. Primaries broad and obtuse, secondaries proportionate .... *Leptarctia*
Primaries long, apices acutely produced; secondaries small, caudate ..... *Ecpantheria*

18. Antennæ of ♂ pectinated 19
Antennæ simple in both sexes 20

19. White species with more produced apices ..... *Spilosoma*
Tawny species with broader, more obtuse wings ..... *Antarctia*

20. Primaries narrow, elongate, apices acute; secondaries rounded; vestiture dense; color tawny ..... *Pyrrharctia*

(SEE PAGE 236.)

Primaries broader, apices marked, but hardly acute; vestiture thin; color reddish.....*Phragmatobia*

Primaries still broader, apices long acute; secondaries subcaudate; size large .....*Arachnis*

The synopsis shows plainly the close relation of some of the genera, though the series is arbitrary in its arrangement. Excluding the *Cydosiinæ*, which perhaps indicate a tendency to the Noctuidæ, we have two fairly distinct series. In the one we find a usually small head, somewhat retracted, and more or less obsolete tongue. The antennæ are moderate in length or short. In the other series, the head is larger, more free, the tongue stronger and longer, and the antennæ are usually longer and more prominent. The position and origin of vein 10 serves as a good basis of division, and this corresponds to some extent with the other characters. The entire family needs further revision. The genera allied to *Arctia* are scarcely sufficiently distinguished, and so *Euhalisidota* seems scarcely distinct from *Halisidota*.

Melanchroia, *Daritis* and *Kodiosoma* are not included in the synopsis. *Ectypia* and *Nelphe* are placed partly by guess, from lack of types for examination.

Eupseudosoma has been sent me by Mr. Conradi, and is a close ally of *Halisidota*, differing in the broader primaries, and very long oblique outer margin.

Finally, the present paper consists rather of a series of notes preparatory to a study of the family, than a critical study. With a good collection at hand, there should be no difficulty anywhere in the family, except perhaps in *Halisidota*.

EXPLANATION OF PLATE.

1. Venation of *Gnophæla hoppferi*.
2. " " *Crocota ferruginosa*.
3. " " *Utethesia bella*.
4. " " *Epicallia virginalis*.
5. " " *Euprepia caja*. *Arctia* does not differ.
6. " " *Nemeophila*.
7. " " *Seirarctia echo*. *Leucarctia* and *Pyrrharctia* do not differ.
8. Venation of *Phragmatobia rubricosa*.
9. " " *Antarctia vagans*.
10. " " *Spilosoma virginica*.
11. " " *Hyphantria textor*.
12. " " *Euchætes egle*.
13. " " *Arachnis picta*.
14. " " *Ecpantheria scribonia*.
15. " " *Halisidota caryæ*.

Cydosia and *Cerathosia* were figured in the Proc. U. S. Nat. Mus. for 1888; *Callimorpha* and *Euerythra* were figured in the same publication the year previous.

NOTES ON COLEOPTERA—NO. 6

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

Corymbites nigricornis Panz. (*metallicus* Payk. *nitidulus* Lec.) This species is widely distributed in North America, from Hudson Bay to Massachusetts, and westwardly to the Rocky Mountains, through which it extends to New Mexico. It also inhabits Siberia, Central and Northern Europe. The typical form (European) is described as metallic black, with the two basal joints of the antennæ and the feet rufous. The American forms found in Northern Michigan and at Sudbury, Ontario, agree with this description, except that I have seen no example with more than the first basal joint of the antennæ rufous. Moreover, specimens occur with the hind angles of the thorax rufescent, and the feet varied in different ways from rufous to entirely brown. From the more southern parts of Canada and from Massachusetts comes a form with a narrow margin and the hind angles of the thorax, its inflexed sides, the prosternal lobe, the epipleura of the elytra, sides of the abdomen and narrow posterior margin of the ventral segments rufous; the feet varying in colour, as in the typical forms.

Except in colour there appears to be no other separative, but this is so striking that it is not obvious, without some study, that the forms are all one thing. No such variation seems to have been recorded among the European forms.

Petalium bistriatum Say.—This is a very small thing, from .04 to .08 inch in length, black, with rufous feet and antennæ, and is frequently beaten from bushes by the collector. There is a form raised abundantly from dead hickory of two years, that is entirely castaneous, with the other characters noways different, except that the dorsal striæ of the elytra are fairly well marked, the intervals with rows of fine soft hair, and the 8th joint of the antennæ, though still short, can be seen in life with a lens; whether this is sufficient difference to be the basis of another species is left to the future monographer. The genus is readily known from all others in this difficult family by the large metasternum projecting forward separating widely the middle coxæ, and by the second ventral segment of the abdomen being as wide as the remaining three conjointly. The insects of this family have a very provoking habit of tucking away the antennæ and folding the legs so as to elude observation without a trouble-

some process. I find it very satisfactory to collect them alive and to place them on the slide of the microscope in a drop of chloroform, which quiets them for a minute, and when reviving the antennæ and legs are extended slowly and may be seen rather better than by dissection.

Raised from the same wood with the above was a specimen of *Hadrobregmus* .18 inch long with eleven jointed antennæ, which if not *pumilus* is a new species, the size constituting the principal difference observed.

Several examples of *Xyletinus peltatus* were likewise bred from this wood.

Purpuricenus axillaris Hald. (Tr. Am. Phil. Soc., X., 31).—This fine species is not uncommon here, and this season numerous examples were bred from hickory wood deadened two years and one-half ago. In the catalogue it is set down as a variety of *humeralis* Fab., but the reason is not very obvious. It is smaller, .45 to .65 inch, (Haldeman gives, .50 to .75 inch, but in over 100 examples I never saw one over .65 inch, .50 to .55 inch being the usual length); cylindrical in outline; thorax moderately foveate-reticulate; elytra sparsely moderately punctured on the basal third, which is mostly of a pale lemon color to orange yellow; the apical two-thirds is entirely black, the anterior portion of which is punctured a little more finely than the yellow portion, and the posterior very finely and densely; a black hair arises from each puncture forming a dense pile that completely conceals the punctuation; the underside is moderately finely sparsely punctured; the black and the yellow portions of the elytra are separated transversely by an irregular border, though the black has no tendency to advance along the suture, but rather the reverse.

Humeralis is larger, .70 to 1.00 inch, considerably depressed and broader in proportion to the lengths; the thorax is very rugosely foveate-reticulate; the elytra on basal third are coarsely sparsely deeply punctured; the punctures on the apical black part are somewhat finer but not dense, and are not concealed by the black hairs; the underside is coarsely punctured; the apical black of the elytra advances normally along the suture to the scutellum, leaving a triangular basal space on each side extending to the marginal third of a bright scarlet color, but sometimes orange. In some individuals the basal spot becomes dilated posteriorly so as to be separated only by a black sutural line, and then the specimen

resembles *axillaris*, but only in coloration. To me they are separate species.

Dorcaschema nigrum Say.—This species requires two years for development, breeding in dead hickory limbs, from a barrel of which more than 500 specimens were obtained from June 3rd to 25th. The larvæ live under the bark till May of the year in which the beetle appears. As the time for pupation approaches they develop an enormous appetite and eat broad cavities in the wood under the bark through which their dust is ejected by a perforation. Some of them pupate in these cavities in which they partition off a suitable space with a wall of compacted dust; but the greater number bore obliquely into the wood to a greater or lesser depth and distance and then outwardly again till near the surface, packing their burrows solidly. The larvæ do not bore entirely to the outside, but stop short one-eighth to one-sixteenth of an inch, leaving the remainder of the wood and the bark to be cut through by the matured beetles, which are just as capable of boring a hole as the larvæ. And in this connection I would state that I have ascertained this season that in the case of Saperda Fayi and S. concolor, the beetles, and not the larvæ, bore the holes to escape by. In the pupa state the very long antennæ are coiled into a spiral of three and lie on the wing pads. In the development probably one-fourth of the beetles are unable to free the entire antennæ from the envelope and appear with one or both deficient in some of the external joints.

Tymnes metasternalis Crotch.—This species appears to be rare among collectors. Crotch described it from Illinois briefly: "Very similar to the preceding [tricolor, the bronze variety], but elytra more sparesly punctate, subcostal; metasternum and ventral segments closely and deeply punctate. L. .22 inch." This season I took twenty-five examples of a form that suits this description well enough, except that in length they measured from .16 to .19 inch, which represents a much smaller insect, but which for the present may bear the name. In *tricolor* the metasternum is scarcely sparingly punctate and highly polished, and there are scarcely any abdominal punctures. This, with the much larger size and more convex form, are sufficient distinctions. With *Rhabdoptera picipes* Oliv. (*Colaspis prætextata* Say) it may be very readily, and probably is, often confounded, as they are nearly of the same size, colour and sculpture, but the underside of *picipes* is smooth like in *T. tricolor* and the tibiæ are not

produced at the apex to a point. The beetles were beaten from a small *Cratægus* growing in a fence corner at the edge of a large grove on June 2nd, 6th and 12th, many of them paired; other bushes of the same species nearly yielded none. *Tymnes tricolor* is rather abundant, varying in the colour and sculpture of the upper side; the bronze coloured is the largest and roughest, occurring in June and July, usually on chestnut; the green variety is found at the same time on hickory, individuals being sometimes bright blue and an occasional one bright coppery. I once took two of the green variety early in April in hibernation, though this is probably an exception to its habit.

Tymnes chrysis Oliv.—This species when found is abundant, but it seems to occur in localities. So far, it has been taken on hickory sprouts growing from stumps, and occurs in June and July. As it has not been described in American works I give a translation of Olivier's: "*Golden-green, thorax and elytra punctate; antennæ and feet rufous.* Like *T. viridis;* antennæ, palpi, labrum above and feet rufous; body green or brassy-green. Sometimes brassy-green, brilliant, shining; head, thorax and elytra punctate. New York, Georgia." Oliv., Vol. 6, 886, No. 16, and figure. *T. viridis* Fab. is the green form of *tricolor*, which is more brilliant in the Southern States, whence were Olivier's specimens. Olivier's description is applicable as far as it goes, but a greater abundance of material shows more variation. The large majority of examples are greenish blue to cobalt blue, while violaceous and bright coppery individuals occur; in some examples the thorax is of one of these colours and the elytra of another; the antennæ are often darker outwardly; the femora are usually piceous black, with the tibiæ and tarsi pale. This is varied in different ways, and sometimes all are piceous. The underside is black or piceous, shining, sparsely, finely and irregularly punctate. Length .18 to .20 inch. This species has the thorax and elytra smooth and rather closely and evenly punctate, and without the elytral rugosities of the other species, and arranged by this character it would be the first or the last of the series.

Rhabdoptera (Colaspis) picipes Oliv. (*prætextata* Say).—Olivier describes his *picipes* as having the thorax *finely* punctured, and as being a little *larger* than *Tymnes* (*Colaspis*) *viridis* Fab., the green variety of *T. tricolor.* It is difficult to find a North American insect in full accord with this description if rigidly interpreted. The bronze form of

T. tricolor with which it has been united has the thorax not very coarsely but still not finely punctured, and in this respect does not quite answer, though usually a little larger than *viridis*.

Rhabdoptera prætextata Say, with which Dr. LeConte formerly united it, and more recently Dr. Horn, with the precedence, has the thorax punctured as in *tricolor*, and is too small by nearly one-half. Olivier's description translated is: "*Beneath piceous; above shining, fusco-æneus; antennæ testaceous, apex black, a little larger than C. viride* Fab. Antennæ testaceous, last two joints fuscous; body above shining, beneath piceous; thorax finely punctate; elytra punctate with confluent punctures. Throughout Carolina." A figure accompanies this description.

This is as good a description of the bronze form of *tricolor* as Olivier gives of either *viridis* or *chrysis*, and as the same exactness of expression did not prevail then as now, the really not very coarsely punctured thorax might have been considered fine by him. It seems scarcely just to Mr. Say to supercede his name, accompanied by a fairly good description, by one that, according to the describer, applies to an insect nearly twice the size and which, like a hermit crab, has been wandering about a long time in search of a suitable shell. In neither of the two species are the elytra confluently punctured. This species is distributed from Canada to Florida and westward to the Rocky Mountains. It occurs here abundantly on the *Vitaceæ*, especially the wild grape.

There is an undescribed species of *Colaspis* or *Rhabdoptera* (if the genus is valid) found in North Carolina, of which I have examples, which is of the proper size to suit the description of *picipes*, has the elytra what may be termed rugosely punctured, and the thorax scarcely more coarsely than *tricolor* or *prætextata;* but it is brilliantly green above. There may, however, be examples, as in nearly all similarly coloured insects, of bright golden or coppery individuals, and if so, it would fit Olivier's description better than either of the other species. There is a difficulty that must be met, or satisfactorily explained, before there can be certainty in any assignment, that is; the name "*picipes*," and the statement that the underside is "*piceous*." Olivier, in describing the other species, names the colour of the legs, which he here does not do, and the legitimate inference

with the name given is that he had before him an insect with dark legs, which neither of the species mentioned nor the nondescript has, and with little tendency to in any individual observed. Possibly the insect described may belong to some foreign country.

Haltica ignita Ill.—This species is so protean in colour, form and in the wide range of the vegetation it affects, that it is difficult to believe all the forms included under this name really belong to one species till one looks for tangible structural differences. It has a very extended distribution, from the Hudson Bay region to Florida and Texas, and was described by Dr. LeConte, from Fort Simpson, on the McKenzie river, under the name *inærata*. It is easily separable into at least three races, two of which occur here in the greatest abundance. The first is the typical form, having the upper side of a brilliant golden-copper colour, though individuals occur with it violet or green. It is found during May on Azaleas growing among huckleberry. A colour variation of this form is found at the same time on Kalmia, with the upper side entirely green, individuals occurring of a coppery and violet colour, or with the thorax violet, or coppery and the elytra green. The length of this form is from .14 to .17 inch; the punctuation of the elytra is comparatively coarse and not very close.

The second form is much smaller, .11 to .13 inch in length; the punctuation of the elytra is finer and less distinct; the form is less elongate, and more depressed; the colour of the upper side is either green or violet, but individuals occur with all the variations of the preceding. It appears here about the first of June and depredates on the Rosaceæ, seeming to have a special fondness for the wild plum, wild cherry and wild strawberry. I have this variety from New Jersey, Florida and Texas; the preceding, from Wisconsin, Michigan and Canada. Dr. Horn, in his Monograph of the genus, mentions a deep blue race, and likewise a brown race without metallic lustre, as occurring in Florida, but I have met with neither. This species is distinguished from all others except *chalybea* and *nana* by the *deep* ante-basal groove of the thorax, which extends *completely* across to the marginal depressions.

Mailed November 5th.

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THE HABITS OF THE POMEGRANATE BUTTERFLY (VIRACHOLA ISOCRATES) OF INDIA, AS RECOUNTED BY DE NICEVILLE, (BUTT. INDIA, III., 478–481).

LARVA .8 of an inch in length when full grown; ground-colour blackish-brown, the constrictions between the segments well marked, the head comparatively large, fuscous, covered with rugosities or short semi-circular tubercles, the segments rapidly increasing in size to the fourth, then gradually tapering to the thirteenth, which latter is about as wide as the second segment; second segment anteriorly flesh-coloured, the third segment entirely flesh-coloured, the seventh and eighth bearing a large dorsal square flesh-coloured patch, the three anal segments scutate, all the segments widely pitted and covered with short but coarse black bristles, which are more numerous at the sides and whitish. This larva is very ugly, to be accounted for, perhaps, by its passing its life out of sight in the interior of a fruit. In Calcutta I have reared the larva on the fruit of the *Randia dumetorum* Lamk., which belongs to the Madder family *(Rubiaceæ)*. I once found a larva in the fruit of the Loquat *(Eriobotrya japonica* Lindl.), of which it ate the hard central seed or stone only. It emerged on April 4th. Messrs. F. E. Partiger and E. C. Cotes have bred it from the fruit of the Guava *(Psidium guava* Raddi.). Its usual food appears, however, to be the fruit of the pomegranate *(Punica granatum* Linnæus).

PUPA of the usual lycænid shape, brown, marked with a dorsal and lateral black line, the whole surface very rough, covered with tiny pits, furnished with a few short coarse bristles, which are most numerous round the sharp anterior ridge which encloses the head; the wing-cases pale ochreous; head rounded; anal segment blunt.

"This butterfly [*Virachola isocrates*] resides in the larva state in the interior of the pomegranate, seven or eight at least [This is very unusual. I have never found more than one larva or pupa in a single fruit; two or

three would probably be the maximum ordinarily, even then one or more would probably have to emigrate to a fresh fruit before becoming full-fed], having been reared in the interior of the small fruit now exhibited. Of the mode in which the eggs are deposited by the female in the interior of the pomegranate no information has been received; it is, however, probable that this is effected whilst the fruit is in its very young state. [The eggs are laid by the butterfly in the calyx of the flower of the young fruit.] The caterpillars feed upon the seeds and inner part of the fruit, which is thus rendered weak and unable to support its own weight, and consequently liable to have its stem broken and to fall to the ground with the first wind. This, however, would be destruction to the inclosed insects since, in all probability, they would find it impossible to make their escape were the fruit to be suffered to lie rotting upon the ground. To obviate this evil, the caterpillars, when full fed, have the instinct to eat a hole [this is incorrectly stated, there is always a hole in the fruit for the larva to cast forth its dejections,] about a quarter of an inch in diameter through the hard shell of the fruit whilst it remains upon the tree; through this hole they then creep to the stem of the fruit, and spin a white web, which they attach to the basal part of the fruit as well as to the stem, for about the distance of an inch along the latter. This web is sufficiently strong to support the pomegranate from falling after the wind has broken the stem near the fruit

"From the circumstance of this specimen of the fruit exhibited, having as many holes in it as there were caterpillars inhabiting it, it is most probable that the web thus spun is a joint production of the whole. It is curious, as evidencing the instinctive impulses under which each of the inclosed larvæ must have acted, that, instead of availing themselves of the first aperture made in the fruit, each caterpillar should be at the trouble of making a hole for itself, a circumstance which renders it the more probable that all joined in spinning the web.

"But it will be at once asked, what necessity could there be for the caterpillars to secure the fruit from falling after each has bored a hole, and thus made its escape? This question is answered by a curious circumstance that, after so securing the fruit, the caterpillars return again into the pomegranate, in the hollow interior of which they undergo their transformations to the chrysalis state.

"Here, too, we may notice another interesting fact, namely:—that

the insect has the precautionary instinct, which acts as a second inducement, to make the aperture in the fruit in that stage of its existence in which it is furnished with organs best adapted for the purpose, for, had the larva omitted taking this step, the consequence would have been that the poor insect, when come to its butterfly state, would have been a prisoner totally unable to make its escape, being unprovided with any instrument sufficiently powerful to make a hole in the shell.

"The chrysalides are attached horizontally upon the inner walls of the pomegranate by means, first, of a patch of silk laid upon its surface to the centre of which the tail of the chrysalis is attached, and second, of a slender silken thread passing from side to side over the base of the abdominal segments.

"Another curious instance of instinct yet remains to be noticed. The butterfly, so soon as ever it has escaped from the puparium, must make its escape out of the hole formed by the larva. Delay would be death, as the wings would soon acquire their full expansion of nearly a couple of inches, in which state it would of course be unable to creep out.

"In the chrysalis state the belly of the insect is placed in contact with the inner surface of the fruit; consequently, as the slit by which the butterfly escapes out of the puparium extends along the back, the under surface of the latter remains entire, the anterior lateral portions on each side of the slit (extending as far as the whole coverings of the wings), curling up and lying close upon those parts which have covered the breast and limbs, leaving the abdominal portion in the same form as when it enclosed the insect. (*Westwood*, Trans. Ent. Soc. Lond., (I.), ii: I., 1837.

"At the time the pomegranate is in flower, and at a very early period, the Hair Streak may be seen very busily occupied about the flowers, and I have little doubt that the eggs are deposited at the bottom of the calyx, from the position in which I have seen the abdomen of the butterfly placed. As the fruit enlarges the eggs are enclosed, and in this situation matured.

"In order that I might obtain a perfect insect I surrounded several of the fruit with fine gauze, but in such a manner as not in the least to interfere with the caterpillar in its labour of connecting the fruit and stalk by means of the web, but to my astonishment and disappointment this never took place. The caterpillars issued from the fruit, and finding their

escape impeded, underwent their change on the external part, and so soon as this was effected I removed the fruit from the tree for the purpose of placing it in a mosquito gauze house in my room. Subsequently I examined several of the fruit, but I never found any chrysalides or the remains of any inside the fruit. I was very careful in my observations and I came to the conclusion that the caterpillars in this instance deserted the fruit when ready to undergo their change." (*Downes*, Calcutta, Journ. Nat. Hist., ii: 408, 1842.) Professor Westwood is quite correct; there is no doubt that in nature this butterfly usually pupates within the fruit; on opening these I have found at different times dozens of pupæ or pupæ skins, but never more than one in each fruit. Mr. Downes is also partially right, as if the fruit are cut off the tree and placed in a box the larvæ, when full-fed, will leave the fruit and pupate anywhere on the sides of the box or on the fruit.

There is one interesting question still to be referred to in the life history of this butterfly—is it attended or not by ants in its larval state, and has it the special organs affected by the ants? Mr. W. C. Taylor, of Khorda, Orissa, writes:—"Larva attended by the ant, Formica nigra, who clear away their droppings and act as sweepers, as well as guard the pupæ." His daughter, Mrs. Wylly, also writes:—"The larva of *Virachola isocrates*, though louse-like in shape, differs considerably from those of *Catochrysops cnejus*, Fabricius, *Azanus ubaldus*, Cramer, and *Tarucus theophrastus*, Fabricius. The latter are inert and slow, the former is very brisk in its movements, and with the protrusible long neck, small head and strong jaws of a beetle grub, is no doubt well-adapted for the work required in making its home. The length of the larva when full-fed is rather more than an inch, and in colour and shape much resembles a ripe mulberry. It had a glossy, shining skin, very knobby and indented all over, of a blue and purple colour, and its three posterior segments covered with a squarish shield with a raised dingy yellow rim to it. The larva bores for itself when quite young a little clean-cut round hole from the outer rind of the fruit of *Punica granatum* to the heart. In this hole it spends its days with its head inside eating away at the green or ripening pips, and enlarging the hole as it increases itself in size. Sometimes three or four larvæ may be found buried in one pomegranate. When at rest and not eating it plugs up the outer hole deftly with the shield on its tail. It is a curious fact that the ants in the case of this species act as sweepers to the larva, hovering in attendance

round the mouth of each hole and performing all the cleaning out operations with great regularity. The larva never leaves the fruit till full-grown [this is doubtful; I think it often seeks a fresh fruit, as I have frequently found a small fruit with the whole interior eaten and quite clean, and no pupa or pupa-skin, so in all probability the larva which inhabited that fruit had left it and sought another,] and then it descends the bark and seeks some crevice, crack or knot in the stem of the tree, and there undergoes its transformations. The ants, as far as I could see did not convey the larvæ to their nest at the foot of the tree, but as there were many larvæ on the tree and few pupæ, some may have been removed to their nest. [These missing pupæ were probably inside the fruit.] I was unable to find any eggs on the fruit or flowers, nor have I ever observed the ants 'milking' any of the larvæ, nor any appearance of tentacles being present. The larva spins a slight but strong web from its mouth with which it binds the fruit to the stalk to prevent its being blown off by the wind, and later uses the silk to fasten itself to by the tail when ready to change to a pupa. The pupa is also attached by two threads flatly to the trunk, and is of a pinkish-brown colour like the bark of the pomegranate tree, with various speckles and marks of a darker brown, and a dark dorsal line dividing it down the centre. The head of the pupa is covered with a kind of plate rounded in front, straight at the neck." For my own part I have never seen ants attending the larvæ, nor have I been able to find the special organs affected by them, and without these I fail to see why ants should take any trouble for the larvæ.

"It is almost impossible with the net to get a really good specimen of *V. isocrates* or of *V. perse*. They are not only difficult to catch, but exceedingly swift, wary, and given to settling on high trees, but, when caught, difficult to secure without injury. There is a delicate bloom on a fresh specimen which the gentlest touch destroys. It is easily reared however. As is well known, the larva feeds inside the fruit of the pomegranate, and sometime before becoming a pupa eats* its way through the tough rind and fastens the fruit with silk to its stalk, thus preventing it from falling off in case it should wither before the butterfly escapes, as it generally does. This operation is performed at night, and generally repeated night after night. I have taken a pomegranate

*This statement is slightly misleading. From the very earliest stages the young larva makes a hole in the fruit, which it gradually enlarges as it grows, and through which it throws out its dejections. At any period the larva can leave the fruit in which it lives, and in fact not infrequently does so, entering a fresh fruit which suits it better.

infested with these larvæ (several usually inhabit each fruit) and made it stand in an egg-cup ; in the morning it was so securely fastened that in taking up the fruit I lifted the cup. Of all animal instincts that I have seen or heard of this is one of the most astonishing and certainly the most difficult to reconcile with any theory of development. As far as I have observed it, the larva never leaves its shelter except for the definite purpose so necessary to its safety, and it taxes ordinary ingenuity to suggest any possible conditions under which some larvæ might have performed the act in the first instance without purpose. I have found this butterfly pretty common in Bombay and Poona from December or January till March at least." (Aitken, Journ. Bombay Nat. Hist. Soc., i: 216, n. 46, 1886.)

Mr. F. E. Pargiter in 1881 wrote this note :—"The larva [of *V. isocrates*] feeds on the leaves [?] and fruit of the Guava tree. It is rather plentifully clothed with short whitish hair. In the two white spots at the tail are two small horn-like processes, which the larva continually protudes and retracts." This latter note appears to be conclusive as to the larva having the special organs affected by ants and that it is attended by ants, though I have failed to find these.

V. isocrates is very common in Calcutta during the winter, much affecting the flowers of the *Poinsettia*. It appears to occur almost everywhere in the plains of India except the desert tracts, but it is not found in Assam or Burma.

GELECHIA GALLÆDIPLOPAPPI (N. Sp.)

BY REV. THOMAS W. FYLES, SOUTH QUEBEC.

Length of body four lines ; expanse of wings eight to nine lines.

Head white, eyes black, labial palpi recurved ; first joint large and white ; lower half of second joint white ; upper brown, with white tip ; antennæ filiform, ringed light brown and black.

Thorax reddish chocolate in colour ; fore-wings rich chocolate red, with a white divided fascia near the hind margin ; under side dark grey ; hind wings pale silvery grey ; fringes grey, with a faint brownish gloss.

Abdomen golden yellow on the upper side of the three first segments, the rest light brown.

Time of appearance the beginning of August.

Described from four specimens bred from galls on *Aster (diplopappus) umbellatus*.

NEW NORTH AMERICAN HOMOPTERA.—II.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

Pediopsis tristis n. sp.

Cinerous varied with fuscous ; apex of the front and basal angles of the scutellum black ; pronotal rugæ distinct. Length 4½–5 mm.

Male.—Face with coarse rugose punctures, arranged in oblique lines on the base of the front ; front black, cinereous at base and next the eyes, with a broad, curved, transverse white band, including the ocelli ; clypeus, loræ and cheeks whitish, the former sometimes tinged with pale green. Form of the pronotum about as in *insignis ;* cinereous clouded with fuscous on the apex and along the posterior margin, with an elongated black spot behind the inner angle of the eye ; rugæ composed of profound elongated punctures. Scutellum obliquely punctured on the disc ; cinereous, with a brownish central band, and black triangular spots within the basal angles. Elytra uniform greyish-brown, subhyaline ; nervures strong, evenly margined with fuscous. Wings pale smoky hyaline, nervures brown ; beneath whitish ; intermediate pectoral pieces with a large black spot, a smaller one just below the propleura, and on the latter a minute dot. Venter dull yellowish, obscured next the connexivum and toward the apex ; tergum more or less embrowned. Legs pale ; sides of the femora and tibiæ, and tips of the tarsi brown or blackish-brown. Plates ligulate, narrowed and somewhat recurved toward the apex ; black or piceous, fringed outwardly with long white hairs. Pygofers white, with a narrow black apical margin, meeting on the ventral aspect almost to their tips, leaving a slightly oblique orifice.

Described from three males collected by Prof. Herbert Osborn at Fairfax, Iowa, June 22nd and 24th, 1889, to whom I am indebted for specimens of this and a number of other interesting western forms.

This sombre coloured species is most closely allied to my *insignis*, from which it may be distinguished by its heavy margined elytral nervures, the large black spot on the apex of the front, and by the rough appearance of the pronotum, contrasting strongly with its peculiar velvety look in *insignis*. Unfortunately there are no females at hand from which to complete this specific diagnosis but there can be no risk in establishing the species on one sex only.

Pediopsis insignis is now known to me from Kansas, Iowa, Michigan,

New York and Ottawa, Ont. It appears to be subject to very little variation.

Thamnotettix lurida n. sp.

Form of *T. subœnea;* pale yellow marked with fulvous; elytra deep fulvous, with a whitish commissural spot. Length 5 mm.

Vertex but little longer at the middle than next the eye; surface covered with deep oblique rugæ which emit the broad margins and medial line, and near the hind margin, on either side, is a minutely punctured area. Pronotum transversely wrinkled. Face fulvous; a large spot on the apex of the front and four or five lateral transverse arcs, pale yellow. Vertex and pronotum pale yellowish; the former with a transverse band connecting the ocelli; the latter, with the lateral angles and four more or less distinct longitudinal bands, fulvous. Scutellum pale, with the basal angles and two small spots between them fulvous. Elytra deep fulvous, opaque, especially on the clavus and base of the corium. A large commissural spot near the apex of the clavus, and some smaller, indistinct ones on the discal areoles of the corium whitish. Abdomen and all beneath deep fulvous ♀, or blackish ♂; the pleural pieces and connexivum edged with pale; legs and genitalia of the ♂ fulvous.

Described from two examples, a ♂ received from Prof. Osborn, labelled "Ames, Iowa, May 19th, 1881," and a ♀ from Mr. G. C. Davis labelled "Agricultural College, Mich., Oct. 24th, 1888."

This pretty little insect is very near my *T. subœnea* from California, but it is broader and shorter; the vertex is not so long as in that species, and with the pronotum is distinctly wrinkled; the elytra are deeper coloured and almost opaque; the valve of the ♂ is produced medially in a short blunt tooth, and the plates are broader, especially toward their slightly divergent tips, and are less heavily fringed. In the ♀ the central tooth on the hind margin of the last ventral segment is narrower and more acute than in its ally.

T. subœnea and *lurida* are characteristic of neither this genus nor *Athysanus*, to either of which they might be referred. Genus *Phlepsius* could, perhaps, be modified so as to include them, as they want only the elytral reticulations of being very good Phlepsiids. From *Scaphoideus* they are debarred by their shorter antennal setæ and broader form. For a note on this genus see Entomologica Americana, Vol. VI., p. 52.

SUBDIVISION OF GENERA.

BY G. H. FRENCH, CARBONDALE, ILL.

I was pleased to see Mr. Cockerell's article on this subject in the September number of the CANADIAN ENTOMOLOGIST, and hope we may hear from others on the question. It seems to me that a genus should, as far as possible, represent a natural division of a group of plants or animals so distinct from other groups that the species forming the genus are easily referred to it. In botany we recognize at a glance such natural genera as *Carex*, *Rosa*, *Quercus*, etc. The fact that the first of these is a large genus is, it seems to me, no good reason why any subdivisions of it should be called genera, for each plant in any one of the divisions is as much a *Carex* as any other one. If the genus is too large to suit the convenience of the practical worker in some part of his work, I have no objection to a subdivision of the genus into groups; in fact every botanist knows that the species do readily divide into such groups. Perhaps it is best to give names to these group divisions instead of numbers or letters as is sometimes done. The main objection I can see to this is that some one, in labelling the specimens in his cabinet and in making his exchanges, will use these names as generic, leading to more or less confusion.

But what is the custom among systematists in different groups of natural history? To answer this question I turn to a few works that come to my hand, and find the following :—

In Botany I find that Wood divides *Carex* into two groups without names; the genus Aster into four groups with names. Mann's Catalogue makes no division of the genera; published 1868. Gray in his "Manual," 1856, subdivides fifty-four genera, using names for the subdivisions, five of these being in the Mosses and Liverworts. In his "School and Field Book" he does substantially the same thing. In his "Synoptical Flora of North America," 1886, he pursues the same plan, the names in most, if not all cases, such as had been used for such subdivisions by some other writer in calling them genera.

In Ornithology I find that Coues in "Key to North American Birds," 1872, makes no divisions of the genera. Baird, Brewer and Ridgway, in "History of N. A. Land Birds," 1874, divide eleven genera by using subgenera names, and divide one genus by sections that are numbered. Mr. Ridgway does the same thing in "Birds of Illinois," 1885.

In Conchology I consulted George W. Tryon's "Structural and Systematic Conchology," 1882. In this a large part of the genera are subdivided into subgenera and subgenus names are used. If space would permit, a review of Mr. Tryon's course in regard to these names would be interesting.

In Hymenoptera I find Dr. A. S. Packard, "Revision of Fossorial Hymenoptera," divides five genera into groups by capital letters; published in 1865. Dr. Henri de Saussure, "Synopsis of N. A. Wasps," 1875, divides genera into subgenera with subgenus names, in a few cases dividing a subgenus into groups and using names for these groups also. Edward Norton, "Cat. of the Tenthredinidæ," 1867–69, uses names in some genera and numbers in others. E. T. Cresson, in his various publications, divides only a few genera, and part of those are divided with names and the rest by numbers.

In Diptera I find Osten Sacken, in his "Cat. of Diptera," 1878, divides two genera into subgenera with names, the genus *Trypeta* into thirty-seven, and *Chlorops* into six subgenera. I have other works on Diptera, but they were not consulted.

In Hemiptera, P. R. Uhler, "Check List of Hemiptera Heteroptera," 1885, no subgenus names used. The other works I had access to were not consulted.

In Coleoptera only Horn's and Henshaw's Check Lists were consulted, and neither of these use any form of subdivision of genera.

In Neuroptera, Dr. H. Hagen, "Synopsis of Neuroptera of N. A." 1861, divides a few genera by the use of subgenus names, others are divided by reference marks as in analytical keys.

In Lepidoptera I find P. A. J. Duponchel, "Cat. of the Lep. of Southern Europe," 1844, divides large genera for analytical purposes, sometimes using a capital letter. "Accentuated List of British Lep." contains no division of genera; published in 1858. Boisduval and Guenee, "Species General," 1874, divide genera into groups by letters, numbers and reference marks, but do not use names. Guenee in his part of the work does the same thing. Grote, in his new "Check List of N. A. Moths," divides *Apatela* and *Agrotis* into subgenera, using names. This is the list of 1890. His lists of 1875 and 1882 contain some section subdivisions, both with and without names. W. F. Kirby, in his "Cat.

of Diurnal Lep.," 1871, uses no form of division of the genera. Mr. Edwards, as we all know, divides the genera into groups and numbers the groups.

This is enough to show that the custom among the best writers in the various departments of natural history varies. Quite a large majority divide the large genera into some form of groups, indicating the relation of the species to each other in this way, while a few shirk all responsibility of showing such relation by arranging the species in large genera alphabetically. Of those given above who divide genera, about twice as many use subgenus names as divide the genera without using names, several using both methods in the same work, and occasionally in the same genus. I noticed, further, that most of these subgenus names are the names that have been used by some former writer for genera, the one using them for subgenus names having either united the genera himself, or taken the work of some one else in that line. This is in line with what Mr. Cockerell suggests.

A NEW FORM OF CERURA FROM CALIFORNIA.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

Cerura cinereoides n. var. or *n. sp.* Head, collar and tegulæ light cinereous; throax above largely mixed with orange and metallic blue scales, below somewhat paler cinereous; tarsi ringed with black; abdomen concolorous with the thorax, the segments banded behind with paler cinereous, the last segment in the female sprinkled with black scales, the anal tuft in the male nearly white. Antennæ white, the pectinations dark brown, long in the male and diminishing toward the tip; short in the female. Primaries pale, almost whitish cinereous, paler basally, much the colour of *Cerura occidentalis* Lintn., and marked after the pattern of *C. cinerea* Walk. A minute black basal spot on the submedian, a little further on another on the subcostal; an extra basilar row of six small black spots on the nervules in a curved line, three on the costa close together, but separable by a lens, one on median, one on submedian vein and one on internal margin, the latter, in one female, faint. The median band composed of black and a few orange scales is faint, much the colour

of the lower part of that in *C. bifida* Steph. (but not that shape). Its internal border is arcuate in the male, more angular in the female. Its outer border is twice indented, once at median vein and again on submedian. The borders are very faint, hardly to be distinguished from the rest of the band. Beyond the band are a few black scales on costa, median and submedian veins. A minute spot on discal cross vein, visible only in one specimen. Beyond this a very obscure undulated diffuse line, hardly to be distinguished at all in the male, and a crescentiform line, darkest on the costa preceding the abbreviated blackish subterminal band, which is broad on the costa, narrows to the first median venule and borders slightly the crescentiform line to internal margin. In this line are a series of small venular orange spots, and it is preceded by a row of seven small venular black spots, the one on the costa elongated, those opposite the cell faint. Terminal intervenular spots very small, about as in *C. aquilonaris* Lintn.

Secondaries white, with black discal spot and small terminal spots.

Beneath primaries paler than above, shaded with black to correspond with the bands. Secondaries white. Both wings have a large discal black spot, and the terminal spots larger than above. In the female there is a common macular median black band. Expanse 36–38 mm.

Described from one male and two females from Los Angeles, California.

This species approaches *C. cinerea* most closely of any of the species in Grote's list, but may readily be distinguished by its pale cinereous colour and small marginal spots. Of the species added by H. Edwards * it is not *albicoma* Strk., nor *bifida* Steph., both of which are before me. Prof. Lintner kindly informs me that it can not be near *bicuspis* Bork., as this is allied to *borealis* Bd., and it can not be *scolopendrina* Bd., as the author describes this as having the wings and collar white—" ses ailes sont d'un beau blanc ainsi que le collier." †

The species, therefore, seems distinct. Since writing the above I have had the opportunity of comparing the larva of this form with that of *C. cinerea*, and find the difference between them to be so slight as not to

* Ent. Amer., Vol. III., p. 231.

† Lep. de la Cal., p. 86.

warrant specific separation. *Cinereoides* is the California form of the species, of which *cinerea* is the eastern form. The marked difference in the colour between the two is the same as in other species which are found from the Atlantic to the Pacific, as for example *Triptogon modesta* Harr., and its variety or form *occidentalis* Hy. Edw. I shall refer more fully in another place to the larval stages of *cinereoides*.

PREPARATORY STAGES OF TOLYPE VELLEDA, STOLL.

BY G. H. FRENCH, CARBONDALE, ILL.

Egg.—Cylindrical, ends rounded; .06 inch long by .04 inch in diameter, smooth. Colour chestnut-brown. Duration of this period about 195 days.

Young larva.—Length .15 inch; cylindrical, a little larger at anterior part; each joint with six tubercles from which arise spreading hairs, varying in length from short ones, that are not longer than the diameter of the body to those that are as long as the body, the two kinds distributed over the whole body; the short ones white and long ones grey; the longest hairs at the anterior and posterior parts of the body a little longer than the long ones on the middle; colour grey, black. Duration of this period three days.

After 1st moult.—Length .22 inch. Colour lead gray; a dorsal line of this colour bordered each side by a pale yellow, not clearly defined, line that is more or less obsolete on the thoracic joints; a subdorsal line of orange-yellow spots, connected by a pale yellow line; two lateral lines of pale yellow; tubercles small, black, those on joint 2 make a sort of collar for the head; hairs pale; legs and venter pale. Duration of this period four days.

After 2nd moult.—Length .25 inch. Much as in the preceding period; mostly lead colour on the back; dorsal line blackish with a whitish line each side of it; subdorsal line yellow, somewhat orange where the orange blotches were before, and paler between, but this time a continuous line; below this a whitish line and still lower two pale yellow lines, the separating lead line wider than the yellow, the lead line containing the stigmata; the ground colour on the sides almost black. There are four tubercles to each

joint; those on joint 2 all prominent and pointing forward; the dorsals on joints 3 and 4 a little less prominent, those on 5 to 11 small, those on 12 and 13 about the same as those on 3 and 4; lateral tubercles just above the legs, large, long and pointing outward and downward giving the body a flattened appearance; hairs on the dorsum not very long, the clusters moderate as to number, the anterior and lateral full and long; all grey. Head black. Duration of this period seven days.

After 3rd moult.—Length .50 inch. Marked as before but the body more a series of alternate lines, and the pale lines more a clear yellow the black lines where wide are mottled with yellow; a whitish patch on the posterior part of the dorsum of joint 4 and the anterior part of 5, and the same on joints 8 and 9, the latter more almond-shaped than the first; tubercles, larger; head and venter lead-black. Duration of this period thirteen days.

After 4th moult.—Length .85 inch. General appearance as before, the yellow mottlings in the black more prominent and the light lines less conspicuous; the lateral hairs white, the tufts full and the hairs long; the dorsal tufts short and spreading; the tubercles lead-black. Duration, of this period fourteen days.

After 5th moult.—Length 1.40 inches. The general colour grey, composed of a great number of fine alternate longitudinal light and dark grey lines, giving a paler shade than during the preceding period; a deep black transverse stripe back of joint 4, shaded each side with dark grey, the black not always showing on account of being more or less covered by the inter-segmental folds; the dorsal tubercles on joint 4 large, buff, studded with short black spines; all the other dorsal tubercles small and hairy, with only about six short black spines to each; the lateral tubercles large, extending outward, from the upper part of the outer end of the tubercles about twelve black bristles or hairs as long as the body is wide; below these are finer white hairs many of which are longer than the black ones; mingled with these white hairs are about a dozen that are tipped with triangular fan-shaped tips resembling somewhat the tips on the tail feathers of the peacock; under parts orange with a round black patch on each joint.

Mature Larva.—Length 2.25 inches. The markings and characters are as at the beginning of this period. Duration of this period from twenty-four to fifty-six days.

Cocoon.—Outline elliptical, fastened to the flat side of the box; 1.50 inches long by .70 inch wide and .30 inch high or deep, a thin film of silk next to the board between the pupa and the upper side of the cocoon that extends out beyond the cocoon as though the larva had first covered an area of the board before forming the other part of the cocoon; the outer part compact except next to the head where it is less so, as though preparing a place to emerge; the hairs of the body woven into the cocoon with the silk; smooth inside; the pupa not attached. Colour light grey, yellowish white inside. The larva makes the cocoon by beginning at one end and working towards the other, and after completion loosely fastening the entrance.

Chrysalis.—Length 1.05 inch, width of joint 5 .40 inch, depth .30 inch, length to the posterior part of the wing cases .55 inch, these extending to the middle of joint 5; length of tongue case .40 inch. The shape is oblong, flattened, ventral side more so than the dorsal, rounded about equally at both ends, no hooks or cremaster at the anal end but six pointed elevations that are not prominent, a dorsal ridge or pronotum. Colour chestnut-brown, dorsal line darker, head pale, anterior part almost greenish-white. Duration of this period about fifty-five days.

There is only one brood in a season, the aggregate of the figures given in the periods of duration of the different stages amounting to 347 days. The eggs from which these notes were taken were sent me by my friend Mr. James Angus, of West Farms, N. Y. The letter accompanying them stated that the eggs were deposited the latter part of September, 1888. There were two masses of them, in elongate strings, not quite straight, one on a leaf and the other on a twig of apple. The mass on the leaf was about 1.15 inches long, the other was about .80 inch. Each string was a single row of eggs; each egg covered over with black hairs from the abdomen of the mother moth. They were placed obliquely on their sides in the string.

During the first part of their larval period they eat about as voraciously and grow as rapidly as most moth larvæ, but after the last moult they feed but little from day to day, the most of the time lying stretched out at full length on a twig or on the side or top of the box. With the rather flat body, made to appear much more so by the lateral tubercles and their tufts of spreading hairs, they simulate perfectly a slight enlargement in an apple twig or small limb.

ON THE FOOD-HABITS OF NORTH AMERICAN RHYNCHOPHORA.

BY WM. BEUTENMULLER, NEW YORK.

(Continued from page 203.)

Orchestes niger and *O. subhirtus* are both found on willow when in bloom. (Harrington Can. Ent. 16, p. 119.)

Orchestes niger and *O. pallicornis* were taken together in July on the leaves of low willows by Mr. Chittenden. *O. ephippiatus* was found in abundance on willow *(Salix fragilis)* by Mr. C. W. Leng and myself on Staten Island, N. Y.

Miarus hispidulus has been observed to breed in the seed capsules of *Lobelia inflata.* Blanchard (Ent. Am. II., p 87).

Cionus scrophulariæ attacks the fruit of the plum, feeding in the kernel. The first mention and figure was given by De Geer in 1775 (Mem. V). In Europe it is found on *Scrophularia* and *Verbascum.*

Gymnetron teter may be found in abundance on the stalk of mullen *(Verbascum Thapsus.)* The larva lives in the seed pods.

Rhyssematus lineaticollis may be found infesting the seed pods of milkweed *(Asclepias.)*

Tyloderma fragariæ lives in the strawberry, excavating the crown and roots of the plant. (Riley.)

Tyloderma faveolatum bores in the stems of evening primrose *(Œnothera biennis).* Also bred from *Epilobium* by Dr. C. M. Weed.

Cryptorhynchus lapathi bores in the stems of willow and alder.

Cryptorhynchus bisignatus was found by Dr. Packard on the leaves of oak. Several specimens were taken by Mr. F. H. Chittenden in the latter part of May at Clifton, N. J., on a chestnut log infested with *Leptostylus macula,* and during the last part of June fifteen or sixteen examples were found on another log of chestnut, some of them copulating; also taken on the trunk of a living birch tree infested with Scolytids.

Cryptorhynchus parochus lives under the bark of butternut. (Schaupp, Bull. Bklyn. Ent. Soc., IV., p. 35.)

Pseudomus truncatus is found on dead limbs of old butternut trees, according to Mr. Harrington. (Can. Ent., 16, p. 118.)

Conotrachelus naso has been bred from the fruit of hawthorn *(Cratægus)* by Dr. Hamilton. (Can. Ent., 21, p. 34.) *C. cratægi* also lives in the fruit of the *Cratægus* as well as that of the plum.

Conotrachelus nenuphar is destructive to the apple, apricot, cherry, peach, pear and quince, feeding in the fruit. *C. juglandis* inhabits walnuts.

Conotrachelus anaglypticus, according to Say, breeds in the fruit of the walnut *(Juglans)*. *C. elegans* was obtained by Say on *Pinus rigida*. (Leconte Ed. I., p. 283.)

Craponius inæqualis is destructive to the grape, stinging the fruit and sometimes destroying the whole bunch.

Rhinoncus pyrrhopus. A pair of these little beetles were taken by Mr. F. H. Chittenden *in coitu* on a common species of dock *(Rumex* sp.), and being confined in a small vial with a part of a dock leaf consumed it almost entirely within a week. The species has also been observed by Mr. M. L. Linell on a species of *Rumex*. June.

Cœliodes flavicaudis, according to Mr. Chittenden, occurs in great abundance on the common nettle *(Urtica dioica)* in May, June and July.

C. acephalus is abundant along the coast of New Jersey on the evening primrose *(Œnothera biennis)*. June, July and August.

Acoptus suturalis Lec. lives in the dead wood of beech trees. Mr. F. H. Chittenden has found the imagines in the wood March 27th to April 20th in company with larvæ apparently of the same species. One of these larvæ taken May 26th appeared about to pupate. The beetles were crawling on the trunk of the tree early in July.

Mononychus vulpeculus infests the seed pods of the blue-flag *(Iris)*. It also occurs on the flowers of *Ceanothus americanus* and *Verbascum thapsus*. (Say, Vol. I. Lec. Ed., p. 286.)

Ceutorhynchus cyanipennis. According to Mr. Jülich this insect is said to be found on grass (Ent. Am., 5, p. 57). In Europe it lives in the roots of cabbage.

Ceutorhynchus assimilis occurs on the radish and *C. rapæ* infests the rape, and *C. septentrionalis* is found on mustard *(Sisymbrium officinale)*.

Trichobaris trinotata bores in the stalk of the potato, causing the stem to wilt.

Ampeloglypter sesostris makes a gall on the grape vine, as also does *A. ater*. (Riley, Bull. Bklyn. Ent. Soc., VI., p. 61.)

Centrinus scutellum-album I found on the flower heads of the daisy.

Balaninus quercus, *B. nasicus*, *B. uniformis* were bred from different kinds of acorns. *B. obtusus* inhabits hazel nuts. *B. caryæ* lives in hickory nuts. *B. proboscideus* and *B. rectus* were bred from chestnuts. The latter also inhabits acorns. (Hamilton, Can. Ent., 22, p. 1–6).

Cylas formicarius bores in the roots of the sweet potato in Florida. (Comstock Rep. Dept. Agricul., p. 250, 1879.)

Eupsalis minuta bores under the bark of oak, chestnut and maple.

Rhynchophorus cruentatus lives in the lower parts of the trunk and roots of the palmetto. I have taken about one hundred individuals at Enterprise, Florida, in May. The specimens were caught boring in the soft pulpy substance in the trunk of a young and freshly cut palmetto tree. *R. palmarum* also lives in the palmetto.

Rhodobœnus 13-punctatus I found on evening primrose *(Œnothera)*. Probably lives in its larval stage also upon the plant. It also infests the stems of *Ambrosia*, *Xanthium strumarium* and thistle.

Cactophagus validus has been found exclusively under decaying *Opuntia* leaves, the larva no doubt living within the leaves or roots of the same plant. (Insect Life, I., p. 199.)

The genus *Sphenophorus* infests roots or lower parts of the stems of various wild or cultivated *Graminaceous* plants (l. c.). *S. parvulus* lives in the roots of meadow grass *(Timothy)*, and *S. robustus* in the roots of maize or corn, and *S. ochreus* in the roots of *Scirpus atrovirens*.

Calandra granaria and *C. oryzæ*. Both these species depredate upon stored wheat, corn, rice and and other grains.

The genera *Yuccaborus* and *Scyphophorus* infest plants of the genus *Yucca* (l. c., p. 199).

The genera *Dryotribus*, *Gononotus*, *Macrancylus*, *Mesites (?)*, *Elassoptes* are strictly maritime, and live in larva and imago states in old boards and roots, etc., washed up on the beach. (l. c., p. 198).

Cossonus corticola I found in abundance under the bark of dead pine trees. At Enterprise, Florida, *C. piniphilus*, *C. concinnus* and *C. crenatus* also live under pine bark. (Ricksecker, Ent. Am., I., p. 96).

Cossonus platalea has been found by Mr. Harrington in numbers under the bark of a partly decayed poplar tree. (Ent. Am., p. 19).

The genera *Allomimus*, *Caulophilus*, *Amaurorhinus*, *Rhyncolus* and *Stenoscelis* live under bark of dead and decaying wood or bore into decaying wood of deciduous or coniferous trees. (Insect Life, I., p. 198).

Dryophthorus corticalis was found under dead pine bark *(Pinus rigida)* by Mr. J. Sherman.

Wollastonia quercicola lives in decaying wood of cottonwood. (Knaus, Bull. Bklyn. Ent. Soc., VII., p. 150).

Himatium errans is inquilinous in the galleries of *Tomicus cacographus* under bark of yellow pine. (Schwarz, l. c.) *H. conicum* has been found breeding under the bark of Tulip-tree, also taken under pine bark by Mr. Chittenden.

Phlœophagus apionides lives in the trunks of wild cherry *(Prunus serotina)* and ash. *P. minor* was found on birch, willow and elm by Mr. F. H. Chittenden; also taken on ash by Mr. Jülich, who found the European *P. spadix* in water-soaked drift wood at the sea shore of Long Island.

Stenoscelis brevis has been taken from old maple and poplar stumps by Mr. Harrington (Ent. Am., I., p. 19); also found on linden, beech, birch, butternut, sycamore and willow by Mr. Chittenden.

Rhyncholus brunneus has been found in wood of *Prunus serotina* by Mr. F. H. Chittenden.

Choragus Sayi was found by Mr. Schwarz in the twigs of dead beech trees which were injured by fungus.

Cratoparis lunatus lives in fungus found on dead oak trees.

Brachytarsus limbatus was raised by Mr. Schwarz from the flower heads of *Helenium tenuifolium.*

B. variegatus breeds in the smut of corn. (Schwarz.)

B. tomentosus was found on rag weed by Dr. Hamilton. (CAN. ENT., 18, p. 114). Also taken on the same plant by Mr. J. Sherman.

Euxenus piceus was found on dry palmetto leaves in Florida by Mr. Schwarz (l. c., p. 85).

NOTE.—I should be pleased to hear from anyone that may be able to inform me of any Food-Habits of North American Rhynchophora not mentioned in the forgoing paper, so that I can notice the same in an appendix which will shortly appear.—W. B.

BOOK NOTICES.

MANUAL OF INJURIOUS INSECTS, AND METHODS OF PREVENTION: By Eleanor A. Ormerod. (Second Edition.)

A greatly enlarged and revised edition of Miss Ormerod's excellent manual has just appeared. There is so much that is new in it that it can hardly be considered the same work. As stated by the editors of *Insect Life*:—"On account of its convenient size, admirable arrangement, plain language, and abundant illustration, it is almost a model of what such a work should be." These merits render it intelligible, and, indeed, indispensable to every farmer, gardener, or fruit-grower who wishes to carry on his work in the most successful manner. The different kinds of attacks are arranged alphabetically under the three headings of Food Crops, Forest Trees, and Fruit. At the end is an alphabetical list of the insects mentioned, and as an appendix an Introduction to Entomology, specially prepared for farmers and others who have no knowledge of the science, in such a way as to enable "the observer of a crop attack to tell at least what kind of an insect is before him." This is followed by a glossary of entomological terms, and a full index. The whole forms a most readable, valuable and reliable work of 410 pages, copiously illustrated with 155 excellent figures.

A noticeable feature is the adoption of the use of the arsenites in the warfare against insects, which has only very recently found favour in England; this Miss Ormerod boldly and wisely advocates.

The advance made during the last decade in the science of reducing the injury to crops by insects, is in a large measure due to the talented authoress of the above work, which, we think, cannot be too highly praised.

J. F.

BUTTERFLIES OF NORTH AMERICA, Third Series, Part X.: By W. H. Edwards.

The last part of Mr. Edwards's superb work has just come to hand. It is of exceptional beauty and interest. Plate I. illustrates the complete life-history of *Argynnis Alcestis*. Plate II. *A. Adiante*, ♂ ♀, and *A. Atossa*, ♂ ♀ (n. s.). Plate III. *Satyrodes Canthus*. Complete life-history. The letter-press is very full. The two first-named species have a peculiar interest since the appearance of Mr. H. J. Elwes's "Revision of the Genus Argynnis," and Mr. Edwards's "Notes" thereon. (CAN. ENT., Vol. XXII, p 82.). *A. Alcestis* is shown to be distinct trom *A. Aphrodite* in all its stages. *A. Adiante*, ♂ is figured from Dr. Boisduval's actual type. Most Lepidopterists will, I think, agree with Mr. Edwards, that this is a good species and quite distinct from *A. Zerene* or *A. Monticola*.

J. FLETCHER.

Mailed December 3rd.

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CORRECTION.—Through a clerical error I have given, on page 189, line 23, *Carabus baccivorus* Fisch. as a var. of *chamissonis* Fisch., instead of a var. of *tædatus* Fab. W. H. HARRINGTON.

No. 1

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REV. C. J. S. BETHUNE.

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THE

Canadian Entomologist

VOLUME XXII.

EDITED BY

REV. C. J. S. BETHUNE.

PORT HOPE, ONTARIO.

MARCH, - 1890.

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1890.

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EDITED BY

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PORT HOPE, ONTARIO.

AUGUST, - 1890

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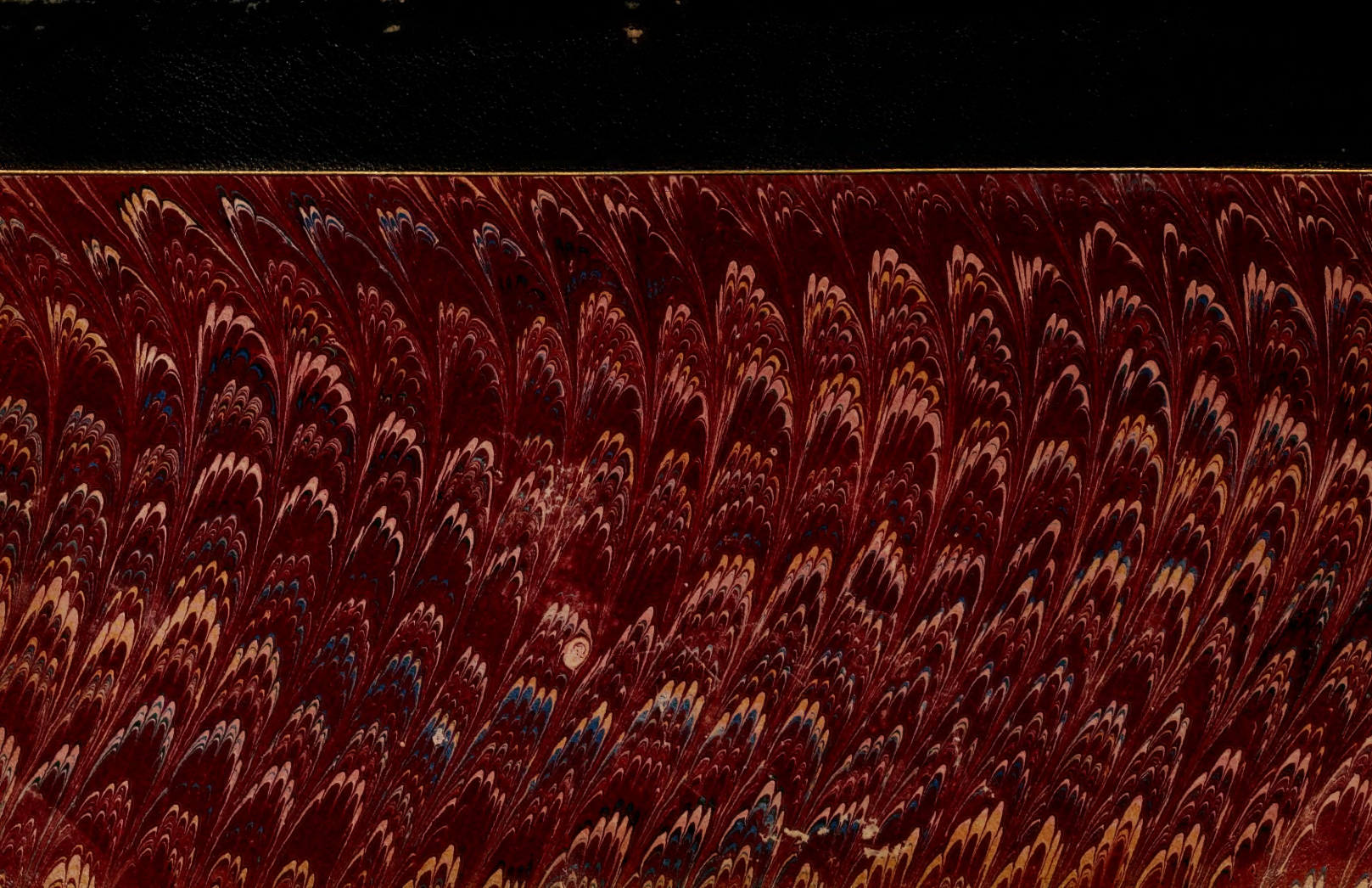
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